THE AUSTRALIAN NAVAL ARCHITECT

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The Austal-built Independence-variant littoral combat ship (LCS) USS *Jackson* undergoing the first of three full-ship shock trials (FSST) off the coast of Florida on 10 June 2016. The purpose of the trial is to validate the operational survivability of new construction ships after exposure to underwater shock. Three tests were scheduled for the ship, with the second and third closer to the ship. Each test was conducted with a 4536 kg explosive charge.

USS *Jackson* was subjected to her third and final test on 16 July and there were reports of seismic activity around the time of the tests. According to the US Navy, the ship performed exceptionally well sustaining only minimal damage. She was able to return to port under her own power.The large amount of data collected during the FSST on the majority of the ship's systems will be collated and analysed by the US Navy in coming months. A number of modifications to the design will be required as a result of the FSST, the cost of which will be shared between the US Navy and Austal on a 50:50 basis in accordance with the construction contract.

USS *Jackson* was the first ship to undergo a FSST since 2008. The US Navy intends to conduct a FSST on the Freedom-variant LCS USS *Milwaulkee* later this year, also off the coast of Florida
(US Navy photograph)

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Cover Photo:

HMAS *Canberra* conducts a replenishment at sea with USNS *Rappahannock* during Exercise Rim of the Pacific (RIMPAC) 2016 off the coast of Hawaii (RAN photograph)

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CONTENTS

RINA Australian Division
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From the Division President

Since the last report, Associate Professor Michael Woodward and Messrs Tom Dearling and Mark Devereaux have joined the Council as the representatives from Tasmania, ACT, and Queensland respectively. In addition, Gerard Engel, who has moved from WA to Tasmania, was appointed to Council inter-sessionally. I welcome them all, and look forward to their active participation on Council.

As noted in my last report, the Council is now working on updating the strategic directions for the Division. In particular, we are discussing the various activities which we feel need to be addressed to maintain our goal of ensuring that we are widely recognised as being the premier professional institution in the maritime engineering field in Australia. Activities include engagement with academic institutions and professional bodies in Australia. This includes support for the courses at both the Australian Maritime College/ University of Tasmania, and UNSW Australia, as well as Edith Cowan University and Flinders University.

Another interesting development is the proposed Maritime Engineering Technology Research and Innovation Centre, which is being supported by a number of universities across Australia. This appears to fit well with the Institution's objective to 'Encourage and promote the carrying out of experiments and other enquiries intended to assist the advancement of knowledge in the science, technology and management of shipbuilding, marine technology, and shipping'. It could be an important initiative in Australia; perhaps the next truly-national centre in maritime engineering since the demise of the Australian Maritime Engineering Cooperative Research Centre.

The Council has also been discussing how best to assist the sections. This could involve help with coordinating speakers for technical meetings, and provision of a central collation, and national distribution of notices for scheduled technical meetings. I know that a number of members travel interstate frequently, and it would be great to give them the opportunity to attend a technical meeting in a different state. I personally have benefitted from this over the years, and am now attempting to visit as many section technical meetings as I can.

Each section technical meeting is run quite differently, and I don't believe that the Division Council should interfere by prescribing how to run a technical meeting. However, it might be possible for the Council to facilitate the distribution of information on how each section works, such that other sections can benefit from different ideas.

We have also noted the importance of inviting non-RINA members to section technical meetings were possible. Some sections hold their technical meetings in conjunction with other institutions, such as IMarEST. However, we probably ought to think wider than that, if possible, and consider bodies such as the Nautical Institute. I know that I have enjoyed many Tasmanian section meetings in the past which have been held jointly with the NI.

A number of other initiatives are being discussed, and I encourage anybody with any suggestions to either contact their local section, or to directly contact me. My email address is martin@renilson-marine.com.

Martin Renilson

One of my most pleasurable tasks as President is to present the Division prizes to students. I'm pleased to say that I was able to present the Division prize at UNSW Australia for the best ship design project which was shared equally between Alex Walter and Alistair Smith. Both Alex and Alistair also won the David Carment Memorial Prize and Medal for the best overall project. Alistair is the son of Warren Smith, a well-known Fellow of the Institution who also received the David Carment Memorial Prize and Medal when he graduated in 1982. I think that this is a bit of a unique father-and-son occasion, and it was great that Warren was able to attend the presentation.

I'm sure that most members will be aware that the next in the very successful series of Pacific International Maritime Conferences will be held next year in Sydney on 3–5 October. This is the Australian Division's premier event, and has always been very successful thanks to the tremendous organisational efforts put in on our behalf by many members, led by John Jeremy. I'm sure that next year will be no exception. Arrangements are now starting for this conference. The program committee has been formed under Adrian Broadbent, and has had its first meeting. The call for papers will be announced in due course.

In addition, the next Australasian Oil and Gas Exhibition and Conference (AOG 2017) will take place on 22–24 February 2017 in Perth. The Institution was a partner for the conference last year, which was very successful thanks to the considerable efforts of Yuriy Drobyshevski. RINA is planning to organise a two-session stream on the topics of Fixed and Floating Offshore Structures, and intends to cover design and construction of ships for offshore operations. The Chief Executive, Trevor Blakeley, and I are both planning to attend the event next year. The call for speakers has not been sent out yet, but this will be done within the next couple of weeks.

Finally, now that the election is over, the country can get back to business. It is very interesting to see that Christopher

Pyne has been appointed to the newly-created role of Minister for Defence Industry. This may be recognition by the Government of the importance of the major defence projects underway, primarily in the maritime sector. I think that it is important that the Institution engage with the Minister and that we offer to work together with him, and his department, to ensure that the maritime projects are delivered successfully.

Martin Renilson

Editorial

To paint, or not to paint? I was moved to pose that question when I saw the photograph below. USS *Coronado*, the Austal-built Independence-variant littoral combat ship (LCS) is unpainted and, in contrast to the Chinese destroyer *Xian* in the background she looks, in my opinion, dreadful. Her hull is streaked with stains, blotched, and even patched. Of course, the aluminium hull does not need to be painted, it will weather satisfactorily, and not painting the ship above the waterline saves money and mass. The latter can be remarkably significant and maintenance is simplified in these modern times when there are few crew members who can be allocated to the mundane task of chipping and painting.

I know, spit and polish do not a warship make, but in times of peace naval vessels have more roles than war fighting. Each ship is an advertisement for her country, and a ship which looks unkempt does not reflect well on her service to the uninformed observer. Also, what is the effect on the morale and pride of her crew? The Freedom-variant LCS has a steel hull and an aluminium superstructure which is unpainted except for that of the first ship, USS *Freedom*, which was painted overall in a camouflage scheme before her first deployment to Singapore.

The contrast between the Australian Customs' patrol boats of the Bay class, which were not painted above the waterline, and their successors, the Australian Border Force's Cape class, is dramatic. The latter have coated hulls and superstructure and look much smarter and present their service better.

Modern coatings are much more efficient and long lasting. There is less need for regular touch-up maintenance and the coatings last longer. I have a feeling that it may not be long before we see more of both variants of the LCS going to sea with an all-over haze grey paint scheme.

On another subject entirely, this edition of *The Australian Naval Architect* has Section news only from New South Wales, and readers will have noticed that some Sections are rarely represented in the columns of *The ANA*. This is not an editorial oversight — despite reminders we simply do not receive contributions from the missing Sections. Production of *The ANA* every three months is a considerable effort, all voluntary. I cannot believe that the unreported Sections are inactive and it is disappointing that news from them is not forthcoming to provide members with a more complete picture of the Institution's activities throughout Australia.

John Jeremy

The littoral combat ship USS *Coronado* (LCS 4) and the People's Liberation Army (Navy) guided-missile destroyer *Xian* in formation during Exercise Rim of the Pacific (RIMPAC) 2016. Twenty-six nations, more than 40 ships and submarines, more than 200 aircraft and 25 000 personnel participated in RIMPAC from 30 June to 4 August in and around the Hawaiian Islands and Southern California. RIMPAC is the world's largest international maritime exercise
(US Navy photograph)

LETTER TO THE EDITOR

Dear Sir,

It has been three years since the last America's Cup and yet I feel as if the tectonic shift that it is causing in sailboat design has just started. Monohull, multihull, small and big boat sailors and designers are just scraping the surface of what can be achieved through foiling and the newest concepts are already breaking the boundaries of what was considered possible.

The addition of foils to ocean racing yachts such as the International Monohull Open Class Association (IMOCA) 60s is just one of the major leaps taken during the past year. The new L-shaped foils fitted to these boats has greatly changed the way solo sailors sail around the world and may prove to be the first big step in adapting this technology to smaller cruising and racing monohulls.

While the lift provided by these boards has improved the performance of the Open 60s by up to 3 kn on some points of sailing, the huge increase in structural loading on the hull and structure has caused major headaches to the designers and builders. Most of the van Peteghem Lauriot-Prévost (VPLP)-designed IMOCA boats suffered structural damage to the foil casings and surrounding areas, with major cracking and debonding in the hull's internal rib structure. In addition to this, the increased speeds have greatly increased the dangers associated with the impact of floating objects, meaning that greater care must be taken when considering these design issues.

It has to be said, however, that the addition of these foils has greatly increased the pitch stability of the boats and reduced the wave-slamming loads which have to be endured by the hull. Because of this, I feel that new performance cruising-yacht design should take into consideration the addition of foil assistance to improve both the racing performance and the cruising comfort.

In a nutshell, there is no doubt that the implementation of the foiling technology currently used in cruising and racing multihulls will keep increasing in new monohull designs, and that these changes may lead to huge increases in both the performance and the fun factor of sailing vessels.

Gian Maria Ferrighi
UNSW Student

NEWS FROM THE SECTIONS

New South Wales

Committee Meetings

The NSW Section Committee met on 17 May and, other than routine matters, discussed:

- SMIX Bash: SMIX Bash: Some sponsors still to pay, and accounts to be finalised; projections are for a small surplus. *James Craig* has been booked for Thursday 1 December 2016, and deposit to be paid.
- Walter Atkinson Award: Nominations due in mid-July; to be discussed at next meeting.
- Technical Meeting Program: Some changes to the program due to presenter constraints.
- Webcasts of TM Presentations: Cost of outsourcing recordings is very high; decided to try recording ourselves for selected meetings.
- Professional Employees Award: Naval architects are covered by this award (see *The Profession* column).

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

- SMIX Bash: Some sponsors still to pay for 2015 (probably to be written off), and accounts to be finalised. Committee has met and effort is now being directed at securing sponsors for 2016. Invoice for *James Craig* booking received and caterers contacted.
- Technical Meeting Program: More changes to the program due to presenter constraints, but program now complete for 2016.
- Walter Atkinson Award: Nominations discussed and two decided for submission to the Australian Division.

The next meeting of the NSW Section Committee is scheduled for 30 August.

CSIRO's New Research Vessel

Tim Asome, General Manager, and Marcus Ekholm, Ship Manager, of ASP Ship Management, gave a presentation on *CSIRO's New Research Vessel* Investigator to a joint meeting with the IMarEST attended by 27 on 1 June in the Harricks Auditorium at Engineers Australia, Chatswood.

Introduction

Tim began the presentation by saying that ASP Ship Management's background is in blue shipping operations such as tankers, passenger ferries and dry bulk carriers, and predominately managing ships around the Australian coast. They also have offices overseas where they supply the same services.

Fundamentals of *Investigator's* Design

The vessel's four main areas of scientific research were base design inclusions:

- Geographical: *Investigator* is equipped with advanced geoscience equipment to map the sea floor and its underlying structure. Attached to the bottom of the ship's hull is a steel housing (shaped like a whale's tail) called a gondola which contains advanced sonar technology. Acoustic signals are emitted which travel in a beam which is 30 km wide in water depths of up to 11 500 m to reveal, in 3D, sea-floor features such as deep-sea canyons and mountains. *Investigator* has sophisticated equipment to probe the make-up of the sea bed and below.

Here Marcus showed a video of the geoscience equipment in operation.

- Biological: Marine biologists on board *Investigator* can study ocean life with the latest fish-assessment sonar which can reach to depths of 3000 m and collect passive

Investigator at cruising speed
(Photo courtesy CSIRO ScienceImage)

data on where species live, eat and breed. Combined with the sea-floor mapping technology, this will greatly improve our understanding of ocean ecosystems. There is also a range of sampling equipment, including small fine-mesh surface nets and large mid-water and bottom trawling nets used to capture species down to 5000 m, sea-floor sampling equipment, incubation and refrigeration facilities.

Here Marcus showed a video of the trawling equipment in operation.

- Atmospheric: *Investigator* is the first Australian research vessel with laboratories dedicated to analysing the interaction between the ocean and atmosphere, and one of only a few around the world fitted with a weat5her radar. Atmospheric research data will help us understand and predict changes in local, regional and global rainfall and weather patterns.

Here Marcus showed a video of the weather radar in operation.

- Oceanographic: Oceanographers seek to understand the dynamics of the ocean and observe changes across seasons and decades to better understand weather, climate, and how changes impact on fisheries, offshore infrastructure and coastal developments. *Investigator* will enable the deployment of large surface and sub-surface moorings, the deployment of oceanographic sampling equipment to depths of 7000 m and the ability to tow equipment 3000 m behind the ship to collect data.

Here Marcus showed a video of the conductivity, temperature and density (CTD) equipment in operation.

In view of these requirements, and the equipment involved, *Investigator* had to be diverse.

Historic Influences on Design

Investigator's predecessor, *Southern Surveyor*, was a converted factory trawler having the following principal particulars:

Length OA	66.1 m
Beam	12.3 m
Draft	5.3 m
Gross tonnage	1594
Main engine	Wartsila Vasa 6R32E MCR 2460 kW @ 750 RPM
Speed (cruising)	11 kn
Range	5200 n miles @ 11 kn
Crew	10
Science personnel	15
Endurance	26 days

Southern Surveyor
(Photo John Jeremy)

Southern Surveyor was capable of many of the above tasks, but not many could be undertaken at the same time. However, many of the tools cross over between the various scientific research projects. For example, a project may wish to know what the sea floor looks like in combination with a CTD (conductivity, temperature and depth) water sample. Furthermore, a single-cast CTD scan can tell five different scientific researchers 20 different things. So, in the name of efficiency, the more eyes looking at each deployed research tool the better the scientific outcome.

As simple as it sounds, to use multiple specialist tools at the same time requires more specialist operators and technicians. And, if you can operate more specialist tools at the same time, then you also need more scientific personnel to utilise the data being collected. *Investigator* now had a calling for not 15, but 40 science personnel berths! And they all had to be fed.

Not only is it important to feed the larger crew as a result of the increased numbers but, with larger crews looking through a broader viewing platform, the science may also be carried out for longer durations. Endurance on *Southern Surveyor* was 26 days at best. *Investigator* can undertake voyages of 60 days, which is a huge difference, to say the least. The design challenge was thus to accommodate almost three times as many crew for more than twice as long! This involved not only accommodating and feeding, but also fuelling the vessel, medically treating personnel, and storing the scientific research data and samples.

Put simply, the design should include a floating self-propelled multi-faceted science laboratory, taking into account geoscientific, biological, atmospheric and oceanographic research, with accommodation for 20 crew and 40 scientists, with a long seagoing endurance and, oh! while you are at it…

The Wish List

Is there room for two drop keels? And can we make it so that the vessel doesn't make any noise?

The drop keels enable data collection to be undertaken outside of the interference of the hull moving through the water.

Here Marcus showed a video of the drop keels in operation. They are foil-shaped longitudinally, sit behind the gondola at about midships, contain scientific equipment, and can be lowered and raised. They are fully retractable so that instruments can be maintained and additional equipment fitted.

In order to improve the performance of the acoustic instrumentation on board, the vessel was built to the Silent R notation under DNV GL classification rules. The vessel is classed with Lloyd's Register, but LR did not have an equivalent notation.

Diesel-electric propulsion was chosen for *Investigator*, with AC propulsion motors because these are generally smaller in size and mass than DC motors, cheaper to procure and replace, and more reliable in terms of life span. Fixed-pitch propellers were chosen as these can be designed to run more quietly than controllable-pitch propellers, ease serviceability and are cheaper to procure. Three diesel generators give the vessel greater flexibility when it comes to fuel saving and dynamic ability to run at certain speeds whilst generating the least amount of noise. Although generally more expensive maintain, the maintenance is easier to carry out. The propeller type has a big impact on high-frequency radiated noise due to bubble cavitation. *Southern Surveyor* had a controllable-pitch four-bladed propeller in a nozzle, while *Investigator* has twin five-blade propellers which have been optimised for low cavitation at the cruising speed of 11 kn. The propulsion motors are resiliently mounted, and the MAK generators are resiliently mounted on rafts which are, themselves, resiliently mounted. All internal hull plates are coated with sound-absorbing paint. Those interested in the details of the noise aspects, can see the reference Kloser et al. (2014).

Manoeuvrability was also a point on the wish list: the vessel needed the dynamic ability to stabilise on station for the duration of certain scientific data-collection sites. The vessel is fitted with a twin-screw twin-rudder configuration, and with a Kongsberg K Pos azimuthing thruster forward and has the DP1 notation with LR.

Investigator berthed at the Marine National Facility in Hobart
(Photo Phil Helmore)

Design of RV *Investigator*

The vessel was designed by RALion and the principal particulars are as follows:

Length	93.9 m
Beam	18.5 m
Depth	9.45 m
Draft	6.2 m
Gross tonnage	6082
Crew	20
Science personnel	40
Main Engines	2×diesel-electric
Propulsion motors	2×L3 AC reversible each 2600 kW
Propellers	2×Wartsila 3.5 m diameter 5-blade fixed pitch
Generators	3×9 cyl MaK diesels each 3000 kW coupled to 690 kV AC generators
Bow thruster	Electric azimuthing retractable 1200 kW
Rudders	2×independently-vectoring Becker high-lift
Dynamic positioning	Kongsberg K-Pos DP1
Cruising speed	11 kn
Range	10 000 n miles
Endurance	60 days
Classification	Lloyd's Register ✠100A1, ✠LMC RESEARCH VESSEL, DP (AM) UMS, ICE 1C, IWS, SPS CODE

Here Marcus showed the general arrangement drawings, including isometric views, of the vessel. Some of the interesting points were the A-frame at the aft end for deployment of trawling and towed sampling gear, the foremast which contains a sampling point for clean air, and space just aft of the superstructure for placement of four 20 ft containers (in two tiers of two) for specialist equipment and labs. The on-board laboratories are on the main deck, starting at the aft end of the superstructure and become cleaner moving forward. The galley, mess and scientists' cabins are on the focsle-deck level (i.e. one above the main deck), and the crew, hospital, offices and conference room are accommodated on the deck above that, with space for two more 20 ft containers forward of the superstructure.

The Build Process

Bringing it all together started with the tendering processes to find

- a suitable design;
- a suitable builder; and
- a suitable project manager.

The contract for design was awarded to RALion, a naval architecture and marine engineering partnership of Robert Allan of Vancouver and Alion Science and Technology Corporation of McLean, Virginia. The contract for construction was awarded to Sembawang Shipyard in Singapore in partnership with TeeKay Shipping Australia as the Prime Contractor and Project Manager. The design used the Woods Hole Oceanographic Institute's vessel *Atlantis* as a springboard, but you have to look closely to see the resemblance because of the modifications made to accommodate the requirements and the "wish list"!

Here Marcus showed a time-lapse video of the build and launch process, including cutting the first steel, fabrication, moving modules onto the building berth, engines being lifted aboard, superstructure module being lifted on, bow module being lifted on, the launching, and then views of the cabins, galley, laboratories, and the lounge.

The Finished Product

RV *Investigator* arrived in Hobart where she was fitted with her computing brain-power, did sea trials, and was then handed over to the Marine National Facility on behalf of CSIRO. The MNF was established in 1984, and takes applications for sea-time on the vessel, scrutinises them for scientific merit, and assesses the importance of the proposed research to Australia and the world, and then allocates time on board *Investigator* in accordance with the resulting priorities. Usual applicants include commercial entities, the Australian Government, CSIRO, etc, although anyone can apply. You could apply with your mates for a weekend fishing trip, for example, but would be unlikely to meet the scientific criteria! Similarly, if BP or Shell wanted to charter *Investigator* to drill in the middle of Sydney Harbour, the question "Why?" would have to have a very good answer, as would the question "Is this a good decision?"

Unfortunately, *Investigator* is limited to 180 days at sea per year due to Government financial policy decisions. The vessel could be used much more efficiently. This is highly political. A private company could charter the vessel for a full charter rate, but this happens very rarely.

The vessel is ice-strengthened; i.e. she can go to the edge of the ice in Antarctica, but she is not an ice-breaker.

The gondola and the drop keels are a challenge when docking, and she needs 3.6 m keel-block height. Previous dockings have been carried out in Singapore, but the Captain Cook Dock at Thales Australia in Sydney can accommodate her on the double-height blocks.

Here Marcus showed a video of applying for sea time on *Investigator.*

Is she right for the job? Fundamentally, time will tell but, so far, she has been an excellent performer. However, there have been some huccoughs. She is a bespoke vessel, and some things are not in the best places. Sembawang is a repair yard, rather than a newbuilding yard, and they learned a lot on the way. If they were to build *Investigator 2* now, then some things would be slightly different, but we are expecting a 40-year life for *Investigator*, so that is unlikely. There have been some issues, with the generators and shore power for example, but these will have various remedies, some ongoing.

Here Marcus showed a video of the latest 60-day voyage to Heard Island.

Conclusion

The design and construction of RV *Investigator* has taken considerable time, but has delivered a vessel which is larger and much more capable than her predecessor, *Southern Surveyor* [*or* her *predecessor*, Franklin*, or* her *predecessor,* Kapala*, or* her *predecessor, the tiny 11 m* Marelda *skippered by Ron Greig*, *for those who can remember her fishing off the NSW coast in the 1950s and 60s*! — Ed].

Questions

Question time was lengthy and elicited some further interesting points.

The final cost of the vessel was of the order of $US150 million, and the build-to-delivery time was a bit over a year. Steel was first cut in January 2012, with the keel laid on 9 May 2012. *Investigator* was transferred from Sembawang Shipyard to the delivery crew on 5 August 2014 for pre-departure testing and setup. The vessel arrived at its home port of Hobart on 9 September 2014 and was officially commissioned on 12 December 2014.

The three generator sets are resiliently mounted on rafts, and the rafts themselves are resiliently mounted.

The vessel is fitted with bilge keels and an active flume-tank stabilising system, i.e. the flume tank is pumped from side to side, rather than being passive.

The gensets are powered by 9-cylinder MAK engines, and the propulsion motors are powered by locomotive engines.

Some machinery has operational or functional limits in high sea states. The scientists know that they have limited time on board and, in order to get as much information as possible, they are keen to work — irrespective of the weather or sea state!

The vessel would have been ideal for the search for the missing flight MH370. However, she was delivered too late to be considered for the search, and then had a committed research program, so other vessels were tasked with the job, including *Fugro Discovery* and *Fugro Equator* and, more recently, this year they were joined by Chinese vessels *Nan Hai Jiu 102* and *Dong Hai Jiu 101*.

Greg Hellessey pointed out that the CSIRO website has a fly-through video of the vessel, and there is plenty of publicly-available data from research voyages on the website, now amounting to at least 40 000 lines of data. How does he know? His daughter has just come ashore from a voyage on board *Investigator*!

[*The MNF website at www.mnf.csiro.au contains all the videos shown during the presentation, including the time-lapse video of the build and launch process, and the fly-through video of the vessel, and are all well worth watching*—Ed.]

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

Reference

Kloser, R., Martin, T. and Sherlock, M. (2014), Characterising the Acoustic Footprint of Australia's New Research Vessel, *Investigator*, *Proceedings Inter-Noise Conference*, Melbourne, 16–19 November.

Hospital Ship *Africa Mercy*

Mick Dunne of Mercy Ships gave a presentation on *Conversion and Operations of Hospital Ship* Africa Mercy to a joint meeting with the IMarEST attended by 30 on 6 July in the Harricks Auditorium at Engineers Australia, Chatswood.

MV *Africa Mercy* is the largest non-government hospital ship in the world. She is operated by the Christian organisation, Mercy Ships, and is crewed almost exclusively by volunteers. Crew members serve from as little as two weeks to many years. The ship is a conversion from the former Danish rail ferry, *Dronning Ingrid*. The conversion was completed in Newcastle-upon-Tyne, UK, between 1999 and 2007 [*See* The ANA, *May 2005* — Ed.]. The ship has five operating theatres and 82 ward beds. She serves primarily in Africa, with the mission of bringing hope and healing to the poorest of the poor.

Marcus Ekholm (L), Tim Asome, Graham Taylor and Alan Taylor (Chair)
(Photo Phil Helmore)

Mick Dunne served as a Marine Engineer Officer in the Royal Australian Navy for 23 years, retiring in 2010 as a Commander. He holds a Bachelor of Mechanical Engineering from Sydney University, a Master of Business Administration from La Trobe University, a RAN Marine Engineering Charge Qualification, is a Chartered Engineer and holds a UK MCA Class 2 Certificate of Competency. He has served as a volunteer onboard the hospital ship, MV *Africa Mercy* with his family since July 2013. They have crossed the Equator three times, twice at the International Date Line, served in the Republic of Congo and Madagascar, and rounded the Cape of Good Hope. His wife, Tammy, works in the Supply Department onboard and their three sons attend the onboard school.

This presentation covered the conversion (briefly), the current machinery, the operations of the ship, the author's experience onboard over the last three years, and Mercy Ships' plans for the future.

The vote of thanks was proposed, and the certificate and "thank you" bottle of wine presented, by Greg Hellessey.

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

Curved Composites Subject to Out-of-Plane Loads

David Lyons, of UNSW Australia, gave a presentation on *Research and Development of Marine Design Rules for Curved Composites Subject to Out-of-Plane Loads* to a joint meeting with the IMarEST attended by 21 on 3 August in the Harricks Auditorium at Engineers Australia, Chatswood.

Introduction

David began his presentation by saying that, five years ago, he had made a presentation to RINA and IMarEST on a similar topic, that keels fall off yachts all the time, and this is bad news, which everyone agreed! He summarised his previous presentation by saying "I'll get back to you". He has not yet reached any conclusions, but this presentation

presents the state of play and his thoughts about the way forward.

He was also pleased to see the classification societies represented in the audience, especially DNV GL, as they are mentioned constructively in the presentation! He would also like to be able to present to the classification societies in approximately three years' time with some draft rules to help prevent ballast keels falling off yachts. A recent example of this was two 12 m Route du Rhum Open 40 class yachts that both lost their keels on the same night, and both had been checked and found to comply with the European Union's Recreational Class A Directive! [*The Route du Rhum is a trans-Atlantic short-handed yacht race, which takes place every 4 years in November between Saint Malo, France, and Pointe-à-Pitre, Guadeloupe* — Ed.]

The Problem Space

Here David showed a slide of the Max Fun 35 yacht *Hooligan V* upside down after losing her keel while on passage from Plymouth to Southampton on 2 February 2007. This happens; it is tragic, as it usually involves loss of life. It is not just composite vessels which lose their keels, aluminium ones do too, and approximately two-thirds of the cases are due to inadequacies in the bilge–keel attachment area. We now have enough recovered evidence to help with backwards analysis of the cases.

He proposes a three-pronged approach:

- Physical testing of specimens. These should not be tiny (which may not scale well), but full-sized specimens with full keel bolted construction and strain gauged in the layup.
- Numerical analysis. This should be a finite-element analysis, with realistic assumptions about the material properties.
- Instrumented on-water sailing. This is to measure the loads experienced by the full-scale vessel on the water.

Hooligan V after loss of keel
(Photo from Marine Accident Investigation Branch Report 19/2007)

The Problem with Today's Marine Codes

Existing marine design codes do not provide guidance for the designer to check through-thickness inter-laminar stress in a vessel's composite structure when loaded—this is simply missing. The codes concentrate on in-plane adequacy of the laminate. It is assumed that the load-carrying fibres and resin matrix perform in an integrated way, addressing in-plane stresses as a result of bending in response to a lateral load.

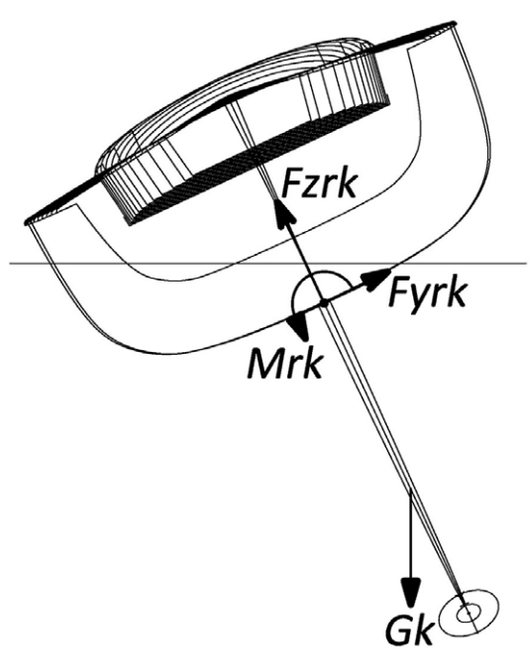
Tensile and compressive fibre fractures are considered; tensile, compressive and shear inter-fibre fractures are considered partially or not at all. This leaves the designer guessing at what is required for true adequacy and must over-engineer to allow for this . Out-of-plane loads are not well catered for, and this arouses suspicion, especially when it results in broken boats.

The Problem Statement

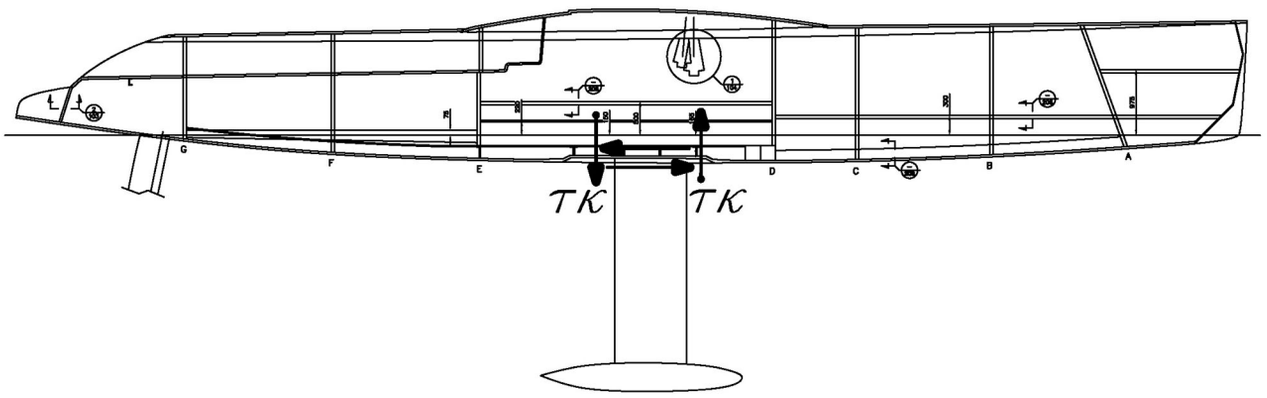
David then showed some slides of the forces involved in a static representation of what is, in fact, a dynamic situation, of the forces and moments imposed on the hull by a ballast keel when sailing at sea. There is a concentrated load on the yacht's hull at the bilge–keel join due to the cantilever and torsional moments imposed by the keel. Many people will have seen videos of yachts falling off waves while taking part in the Sydney–Hobart Yacht Race.

Transmitting the forces and moments to the hull requires a system of as many as four or five transverse floors in way of the keel, supported by associated longitudinal girders.

Ballast keel on Vanguard 60
(Photo courtesy David Lyons)



Transverse forces and moments imposed on the hull by the ballast keel
(Diagram courtesy David Lyons)



Longitudinal forces and moments imposed on the hull by the ballast keel
(Diagram courtesy David Lyons)

Keel flange and bolt arrangement on the Vanguard 60
(Photo courtesy David Lyons)

Internal floor arrangement on the Vanguard 60
(Photo courtesy David Lyons)

For the ballast keel of the Vanguard 60, the flange is 65 mm thick in 500 MPa L6A alloy steel, secured to the hull by 16 high-yield stainless-steel threaded studs. The bulb has a mass of 4 t, and the loads are transmitted to the composite fibre structure in the hull.

In the European Union, ISO 12215 is the default standard in order to obtain the CE mark for a Category A recreational vessel less than 24 m scantling length, although classification society rules are very often employed as well. Despite having rules in place, and vessels complying with the rules, failures are still occurring.

Aims of the Research

The aims of the research are to

- Identify the current understanding and treatment of inter-laminar stresses in composite design with reference to general underpinning theory, testing and analysis. The emphasis is on out-of-plane loading.
- Uncover current practical approaches to dealing with inter-laminar shear in non-marine design, construction and inspection practice and assess their applicability in the composite marine context.
- Design a methodology whose ultimate aim is to arrive at a set of composite marine design codes which address through-thickness/out-of-plane inter-laminar strength adequacy in both the intact and damaged conditions.
- Bridge the gap between broad theory and targeted marine design.

Earlier work in this area has been done by Jun Ikeda in his BE thesis *Analysis of the Keel Structures of Composite Yachts* and Raju in his PhD thesis *Failure Analysis of Composite Top-hat Stiffeners using Acoustic Emission and Embedded Fibre Bragg Gratings* at UNSW Australia.

Failure of Curved Composite Structures

The world of boat structure comprises various components in curved formats—plates, I-beams, radiused top-hat sections, and the like. Failures of the structures can have fatal consequences, and here David quoted some examples: *Rising Farrster* in 2001 with one dead, *Moquini* in 2005 with six dead, *Bavaria Match 42* in 2005 with one dead, and *Cheeky Rafiki* in 2014 with four dead.

It is a global problem, illustrated by locations on a map of the world — east coast of the USA, west coast of Mexico, east coast of South Africa, the Mediterranean, and the Tasman Sea.

Existing Composite Marine Design Codes

Codes which cover marine composite construction include

- DNV GL *Rules for Classification: Yachts*, Part I Ship Technology, Section 3 Special Craft—Guidelines for the Structural Design of Racing Yachts.
- Lloyd's Register, *Rules and Regulations for the Classification of Special Service Craft*.
- American Bureau of Shipping, *Guide for Building and Classing Sailing Yachts*.

- International Standard ISO 12215: Small craft—Hull Construction and Scantlings, particularly Part 5 Design Pressures for Monohulls, Design Stresses, Scantlings Determination.

DNV GL is currently the most active in this area, with their rules having come mainly from the partnership with Germanischer Lloyd. However, ABS deserves accolades for their pioneering work as well, introducing their *Guide for Building and Classing Offshore Racing Yachts* in 1981, which has become the basis for other rules too.

Consider some of the statements in the DNV GL rules:

- "the evaluation of stresses/strains is focussing on the spot where the maximum *through-thickness* shear stress/strain occurs"
- "with solid coreless laminates, the through-thickness inter-laminar stress is *rarely a design criterion"*
- "beams should be designed in a way that the transfer of loads is *fibre-dominant"*
- "in general it is preferred to have a fibre-dominant load absorption in a composite structure, but in some cases it will be *unavoidable that through-thickness effects occur*".
- "matrix dominant behaviour is not preferred … *through-thickness loading (especially shear and tension) cannot always be avoided* and yet needs to be handled in an appropriately conservative way … delamination caused by overloading, impact or deficient structural design is considered to be the cause for subsequent failure of components and thus can be deemed as the cause for fatigue with composites".

The designer is left with no means of identifying the critical through-thickness load points in either the intact or damaged condition where through-thickness strength can be reduced by up to the order of 90%, and what to do about it.

David has spoken to all the expert practitioners in composite yacht design, including Gurit, Composites Consulting Group, High Modulus, Reichel-Pugh, and others, about out-of-plane loading, and they all say yes, it's a worry, and cater for it by over design and/or successful past practice and in-house advanced analysis that is proprietary.

Other Composite Design Codes

There are composite design codes in fields other than marine.

British Standard BS EN13121-3:2008 (+A1:2010) *GRP Tanks and Vessels for Use Above Ground—Part 3: Design and Workmanship*.

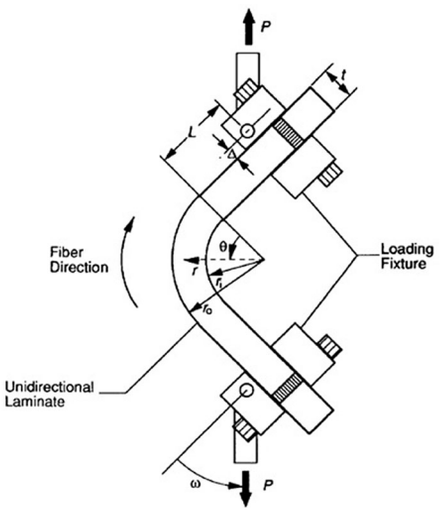
Creemers, R.J.C. produced a Technical Report, *Inter-laminar Shear Strength Criteria for Composites: An Assessment by Means of Statistical Analysis*, which was specifically for thick laminates subject to through-thickness (transverse) loads in aircraft landing gear.

This leads us to wonder if the same sorts of failures are happening in other fields, and they don't seem to be, outside of the marine area, at least to the same extent with such consequences. So, we may not have to re-invent the wheel, but take some note of what is being done in other fields.

Food for Thought

More than thirty years ago, Kitching et al. tested very thick laminates and found inter-laminar tensile strength values of the order of only 10% of in-plane strengths. As soon as the loads on the marine structural laminate are 'thrown' from the fibre-dominant direction to the matrix-dependent through-thickness direction, such consideration becomes critical!

Imagine an L-shaped laminate under a tensile loading at 45° to the arms of the L, pulling the arms apart. The load results in an inter-laminar stress at the bend, pulling the laminates apart. In this case, you would be likely to hear an acoustic emission (noise) as the laminates come apart—something like the noise you would hear when crawling far out along a tree branch and the branch starts to fail at the trunk of the tree!



Inter-laminar tensile strength
(Diagram from Jackson and Martin)

The stresses which occur in the radial direction at the laminate bend are through-thickness (tensile) and the geometry of the ILTS specimen mimics the bend at the base of a stiffener such as a keel floor found in way of the attachment of a sailing yacht's ballast keel.

Furthermore, a damaged keel attachment structure will have impaired through-thickness strength of less than about 50% of the undamaged strength. Existing marine codes make no allowance for this either, other than with a broad factor-of-safety.

Laboratory Tests

Raju's work considered isolated 100 mm sections of top-hat stiffeners using laminates provided by David [*then at EMP Composites* — Ed.] He suggested that a failure analysis of top-hat stiffened panels be conducted in the region where the whole keel is attached. These should use the same laminates as the on-water test vessels

A test matrix is being developed which systematically varies laminates, and tests for response to bending, as suggested by Raju for further work. Failure detection methods, including acoustic emission and embedded strain gauges, will be used.

Open-water Testing

A full-size Comar 36 has been built in Italy for sailing yacht aerodynamic investigations and measurement of rig loads. However, load sensors can be placed in the bilge areas to obtain other information at the same time.

In addition, David has access to the Lyons 60 yacht *Triton*.

The Como 36
(Diagram from Lecco website)

Lyons 60 *Triton* powering to windward
(Photo courtesy David Lyons)

SHM and NDE

Two terms that are commonly used in the area are SHM and NDE.

SHM is structural health monitoring whereby, with fibre optics and smart structures, you can get a feel for how the structure is faring during in-service operations, i.e. real-time information under load.

NDE is non-destructive examination, which can determine whether there is a problem in a structure before failure occurs. Marine surveyors of composite structures often say that they didn't check something because they couldn't see it. This is only partly true! They can use ultrasonics, thermographics and shearography, but it will cost some more to do. Do you want to *know*, or do you want to hope, because you can't see it?

Here David showed a slide with an ultrasonic image of a keel floor damaged after grounding, and a laser shearograph of hull damage in way of the keel after grounding, and the damage was clear in both cases.

Conclusion

The aim is to research the background to, and provide evidence for, the development of marine design codes which address the through-thickness inter-laminar strength of composite laminates. The work is justified by structural failures causing loss of life on repeated occasions over the last few decades. A literature review including a search for design codes in related fields of application has been outlined and this review will continue throughout most of this work. A newly-developed marine code would address through-thickness strength requirements dealing with loads in the intact and damaged states, such as those experienced by sailing yachts subject to highly-concentrated ballast-keel loadings.

Questions

Question time was lengthy and elicited some further interesting points.

If we extend the case histories back some time, then problems are currently about equal for yachts constructed of composites and aluminium. However, no-one is building aluminium yachts any more, only composites, so the pendulum is bound to swing to more problems with composites.

The failure is due to a combination of inadequate knowledge of the hydrodynamic loads, and inadequate strength of the structure.

The current move in matrixes is to use epoxies, which are good, and away from polyesters, which are weak, with vinylesters in between. Production vessels are all polyester, because they are built to a price. The fibre:resin ratio is typically 65:35, independent of the matrix.

In general, hand layups can be subject to fibre misplacement and wrinkles which can lead to problems. The advantage of prepregs is that they typically get greater attention to tooling, have moulds of carbon fibre, and better control in general.

Is any investigation carried out after grounding or other damage to check on the integrity of the structure? The International Sailing Federation should be involved, to determine whether in-build surveys should be required and, by extension, whether post-incident surveys should be required. However, they have not done anything, and leave it up to the insurers. Club Marine, which is owned by Allianz, is now very interested in this.

For the development of marine codes, are we talking about thicker laminates, new fibres, new resins? A good question, with no answers yet. However, thickness does help. You don't necessarily increase the allowable shear stress, but there are more plies available to take the load. ABS, for example, had a rule that the thickness of a laminate had to be at least equal to the diameter of a bolt passing through. There was no science in that rule, but it was a good rule-of-thumb.

The vote of thanks was proposed, and the certificate and "thank you" bottle of wine presented, by Em/Prof. Lawry Doctors.

Phil Helmore

COMING EVENTS

NSW Technical Meetings

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

The program of meetings for 2016 (with exceptions noted) is as follows:

7 Sep Drew Shannon, Manager East Coast, London Offshore Consultants
Salvage of Rena *in New Zealand*

5 Oct Nick Browne, Research Supply Icebreaker Project Manager, Australian Antarctic Division
Australia's New Antarctic Vessel

1 Dec SMIX Bash

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 15–18 November 2016, in Australia, with location to be advised.

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."

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

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.

For further information, please see www.drydocktraining.com/.

This training will be held in conjunction with the Australian Shipbuilding and Repair Group (ASRG). Registration and payment may be made directly to ASRG. Contact Liz Hay at liz.hay@asrg.asn.au or call (07) 5597 3550.

Pacific 2017 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 3–5 October 2017 and Pacific 2017 will be held at the brand-new International Conference Centre at Darling Harbour.

The domain name of www.pacific2017.com.au has been registered and the website is parked. For further initial details, contact expo@amda.com.au.

The Call for Papers for the Pacific 2017 International Maritime Conference will be issued later this year; meanwhile, put these dates in your diary and watch this space!

HPYD6

HPYD is a series of conferences on high-performance yacht design organised by the Royal Institution of Naval Architects (RINA) NZ and the University of Auckland. The first conference was held in December 2002. Since then, the conferences in 2006, 2008, 2012 and 2015 have showcased the latest developments in yacht research from around the globe. The conference enables naval architects, engineers, designers and researchers to present and hear papers on the current state of high-performance yacht and power craft technology.

Agreement has been reached between HPYD, SNAME (Chesapeake Section) and Ecole Navale (Innov'Sail) to provide a coordinated rolling three-year program of high-quality yacht technical conferences. As a result, HPYD6 will be held in Auckland, New Zealand, in early 2018 during the stopover of the Volvo Ocean Race.

The call for papers will be posted in 2017. You can follow HPYD on Facebook, LinkedIn or sign up for their mailing list to get the latest news.

See www.hpyd.org.nz for more details or, for general information, email info@hpyd.org.nz; for registrations: registrations@hpyd.org.nz; for technical enquiries: technical@hpyd.org.nz; for sponsorship opportunities: sponsorship@hpyd.org.nz.

CLASSIFICATION SOCIETY NEWS

LR Defines Autonomy Levels for Ship Design and Operation

With autonomous ships likely to enter service soon, LR has set out the 'how' of marine autonomous operations in a new ShipRight procedure guidance. The guidance describes autonomy levels (AL) ranging from AL 1 through to AL 6 denoting a fully autonomous ship with no access required during a mission.

The AL system of levels provides clarity to designers, shipbuilders, equipment manufacturers, ship owners and operators, enabling accurate specification of the desired level of autonomy in design and operations and paves the way to a clearer understanding of the investment opportunity/risk equation.

The procedure takes the user from identifying the initial 'business need' to a 'systems classed' status of a design and a ship, ultimately, in operation.

Luis Benito, LR's Head of Innovation Strategy and Research, says that autonomous ships are a reality "Maybe a few years ago this was seen as unlikely. Today, the market wants autonomous ships which can be operated with varying levels of control. So, we have now described and delivered the levels required to make decisions enabling the design, construction and operation of autonomous ships to take place. The levels provide a procedure to address the safety and practical issues required to meet classification, regulatory and market drivers."

LR is working with leading industry players to make autonomous shipping a practical reality. This guidance has been peer reviewed by leading technology companies.

Benito adds "In the future everything will be cheaper, but with better performance. That's what the market is looking for. But, most importantly from LR's perspective, as well as being more cost effective, shipping can also be safer. Safety will reduce costs. We are only at the start of the cyber ship and a cyber-enabled shipping industry, but we are making amazing progress. We are trying to help the industry adopt the data, digital and connectivity technologies which could deliver benefits to shipping—and to help keep ships safe.

"We are working with clients to create the new generations of cyber-ship safety, security and maintenance monitoring and performance guidance which will help secure improved performance and return on investment. Autonomy is one part of our cyber-shipping opportunities."

The guidance may be downloaded now at www.lr.org/cyber.

LR *News and Insight,* 9 July 2016

LNG-Fuelled Vessels Go Big with Project Forward

ABS has teamed up with partners Arista Shipping, Deltamarin, GTT and Wärtsilä in the "Project Forward" joint development project (JDP) to develop a dry bulk carrier concept which employs LNG as fuel.

The goal is to develop a Kamsarmax bulk-carrier design

AOG | AUSTRALASIAN OIL & GAS EXHIBITION & CONFERENCE 22–24 FEB 2017 PERTH CONVENTION EXHIBITION CENTRE

Call for Speakers
Fixed and Floating Offshore Structures

The Royal Institution of Naval Architects will be participating in AOG 2017 in Perth and organising a Conference stream. Expressions of interest and submissions of abstracts are invited from RINA members, academia and industry experts.

The RINA conference stream **Fixed and Floating Offshore Structures** will cover the design, construction, installation and decommissioning of structures and systems:

- Fixed and floating structures
- Ships for offshore operations
- Station-keeping systems
- Renewable energy offshore structures and systems

The stream will follow from our participation in AOG 2016 and will provide a forum for professionals in the area of offshore structures and marine vessels. Submissions which reflect the current oil and gas market and focus on its economic implications and engineering innovation in the offshore industry are especially welcome.

RINA involvement in AOG 2017 is strongly supported by the WA Section, the RINA Headquarters and the Australian Division. Attendance of the conference stream will be complementary for the AOG Exhibition delegates.

For more information about the AOG Event and last year's conference visit: http://aogexpo.com.au/conference/overview/

If you would like to make a submission or register your interest in participating please let us know by sending e-mail to: wa@rina.org. **The closing date for this call is 30 September 2016**.

to be the first of this type suitable for worldwide services powered by LNG in compliance with the International Maritime Organization's Energy Efficiency Design Index 2025 standards, NOx Tier III and Marpol Annex VI SOx emission levels. This landmark design will be the first LNG-fuelled cargo ship capable of full-range operations.

"The long-term potential for LNG as a marine fuel is tremendous," says ABS Vice President of Global Gas Solutions, Patrick Janssens. "We see the near-term opportunities for larger vessels on fixed and known trade routes, but more opportunities will emerge as concepts mature and bunkering infrastructure expands. Environmental stewardship will continue to be a concern, and owners will be evaluating alternative fuel choices."

"Project Forward represents a milestone for the shipping industry in bringing to the market a practical, achievable design for what are the workhorses of the shipping fleet," says Arista Shipping Principal, Alexander Panagopulos. "Our mission is to develop the next generation of energy-efficient and environmental-friendly dry-bulk cargo ships to be sustainable worldwide beyond 2030. It marks a number of 'firsts' and draws together the experience of a team of leaders in their field to make LNG-powered shipping a reality on the high seas."

Technical challenges in developing this design were considerable, as there is a need to carry a large volume of LNG (2500 m^3)—which corresponds to full-range operation and 40 days—in a type of ship where available space is limited and cargo space is at a premium.

ABS will provide approval-in-principle for the concept, which is based on the highly optimised Deltamarin B.Delta 82 design, utilizing a GTT membrane LNG fuel tank. This design could also be applied to other bulk carrier sizes and serve as the basis for an LNG-fuelled tanker. The concept features a Wärtsilä four-stroke medium-speed engine without auxiliary generators, the first time this configuration has been applied to a vessel of this type, significantly simplifying the vessel's engine-room arrangement and contributing to lower capital expenditure.

ABS Nautical Systems Enables Next-Generation Vessel Performance

ABS has unveiled ABS Nautical Systems Vessel Performance, a comprehensive software solution developed in response to continued demand for tools which improve vessel efficiency, reduce costs and facilitate emissions reporting and compliance.

The NS Vessel Performance tool is designed to improve efficiency and control costs through the application of a ship-specific performance model and tracking of key performance indicators (KPIs), while also supporting environmental compliance and reporting, including the European Union's Monitoring, Reporting and Verification (MRV) regulation for CO_2 emissions.

"We take an innovative approach to vessel performance and this solution delivers the industry's most comprehensive performance-management tool available," says Stephen Schwarz, Vice President and COO of ABS Nautical Systems. "By uniting all the major aspects of performance management, informed by the understanding of vessel design, our solution provides the next generation of actionable insight and decision support with custom-designed visualizations of KPIs and is backed by consultation with ABS experts at regular intervals."

NS Vessel Performance leverages a ship-specific performance model based on vessel design characteristics. The model delivers performance predictions using sea-trial data and other relevant information to establish performance baselines. Combining model output with the visualisation and analysis of vessel operations data improves decision-making.

"Eastern Mediterranean Maritime has been a client with NS for almost 20 years, and the software has been instrumental in increasing our overall efficiency," says Nikos Kripotos, Eastern Mediterranean Maritime Superintendent Engineer.

Based on the performance model and analyses of regularly captured data, KPIs are established within the tool to enable decision support ashore and on board the vessel. This results in operational profiles for fleet-wide comparison of operational efficiency, maintenance strategies and conformance to charter-party requirements. Consumption and emissions calculations enable compliance with environmental regulations, including MRV, and contribute to an active ship energy efficiency management plan.

Craig Hughes

New Zealand Awards Contract for Construction of New Fleet Tanker

New Zealand has awarded a $NZ493 million contract to the South Korean shipbuilder Hyundai Heavy Industries for the construction of an ice-going tanker for the Royal New Zealand Navy.

According to the defence minister, Gerry Brownlee, the new ship will be ice-strengthened and winterised for operations in Antarctica and is expected to be delivered in 2020.

The ship will be supporting NZDF deployments, including maritime sustainment, and humanitarian and disaster-relief operations.

She will replace the 30-year-old tanker, HMNZS *Endeavour*, which currently provides fuel to Royal New Zealand Navy and other partner nations' ships and embarked helicopters, and supplies fuel and fresh water to support land operations.

HMNZS *Endeavour* is due to retire in 2018.

The new vessel will be significantly larger, with an ability to refuel two ships at a time while underway, Gerry Brownlee said.

The ship will also carry and refuel defence force helicopters, produce and store water, and store and transport bulk goods.

The recently-released New Zealand Defence White Paper placed greater emphasis than previous White Papers on protection of Southern Ocean resources and supporting New Zealand's civilian presence in Antarctica.

An impression of New Zealand's new fleet tanker
(Image courtesy HHI)

New Anzac Frigate Maintenance Contracts

A new sustainment agreement between the Australian Government and defence industry to support the Royal Australian Navy's Anzac-class frigate fleet, signed in April, came into effect on 1 July with the first order worth approximately $200 million to BAE Systems.

Valued at over $2 billion over eight years, the partnership includes BAE Systems Australia, Saab Australia, Naval Ship Management and the Commonwealth of Australia.

BAE Systems involvement in the alliance, known as the Warship Asset Management Agreement (WAMA), will include asset management in Rockingham (Western Australia), platform engineering and integration support in Williamstown (Victoria) and major refit and upgrade implementation at Henderson (Western Australia).

The initial program agreement covering the first 18 months of work under the program was signed on 30 June and includes work to be done on the first ship to enter the Life-of-type Assurance Programme (LOTAP) at the Company's Henderson shipyard.

BAE Systems will perform design work for the Platform Systems Remediation (PSR) project which HMAS *Perth* will undergo first as the lead ship of the class during the period of this first program agreement.

BAE Systems Australia's Chief Executive, Glynn Phillips, said "BAE Systems involvement in this agreement reflects the work that the company has done to date in the sustainment of the Anzac-class fleet over the last 15 years, including the upgrade of these frigates with a world-leading anti-ship missile defence capability."

"Our work on this program allows industry to retain important skills in engineering and program management which are contributing to our current role providing sustainment services across four different classes of naval surface ships and our potential future role in the sustainment of new ship classes including the air-warfare destroyer transition-support partner, the offshore patrol vessel (SEA1180) and future frigate (SEA5000) programs."

HMAS *Perth* will be the first Anzac-class frigate to undergo platform systems remediation
(RAN photograph)

Saab Order for Anzac Frigate Upgrade Services

The Australian government has contracted the Swedish aerospace and defense company, Saab, for work on the sustainment of the combat system on Australia's Anzac-class frigates.

The order value amounts to $A37 million and covers services from July 2016 until December 2017.

This is Saab Australia's first order under the recently-signed Warship Asset Management Agreement (WAMA), the company said. WAMA is an asset-management organisation which is responsible for the overall performance and delivery of seaworthy Anzac-class warships and support infrastructure to the Royal Australian Navy.

Under the long-term asset-management agreement, Saab Australia, which is part of Saab's business area Surveillance, will provide on-going engineering support services in both Western Australia and South Australia.

"The agreement and this order reflect our highly-successful and long-term commitment to the Anzac frigate and the Royal Australian Navy" said Dean Rosenfield, Managing Director for Saab Australia.

Saab is part of the WAMA team charged with ensuring that the Anzac-class ships remain at a high level of availability and capability for the Royal Australian Navy. Together with CEA Technologies, Saab's Anti-Ship Missile Defence (ASMD) system has provided the frigates with upgraded radar and combat-system technology.

Saab hopes to build on the Anzac frigate collaboration by winning a combat-system contract under the new Australian future-frigate program.

HMAS Farncomb Completes FCD

HMAS *Farncomb* has returned to the RAN Fleet after a successful full-cycle docking. *Farncomb* is the first of the Collins-class submarines to operate under the new operational cycle of 10 years in operation and two in dock.

Not only was the occasion a validation of the new maintenance cycle, but delivery of an upgraded *Farncomb* as the fifth submarine in fleet service also marked a key milestone in the increased availability and lethality of our Submarine Force as the nation's principal strategic deterrent.

Commander Submarine Force, CAPT Matt Buckley, announced that the Training Authority — Submarines had trained a record number of new submariners during the last year.

With the delivery of *Farncomb* to the fleet and the availability of a fifth submarine crew, the RAN now has more active submarines, which was a key outcome from the Coles Review, a study into the sustainment of Australia's strategic Collins-class submarine capability.

This 'Five Boat Force' is also a positive indicator towards the effectiveness of the submarine workforce growth strategy. It assists in the Navy's capacity to train new personnel to serve in the submarine force where they will operate state-of-the-art equipment with an increasing operational tempo and presence in the Indo-Pacific theatre.

Australian Navy Submarine Returns from Record Deployment

The submarine HMAS *Rankin* completed a record deployment when she recently returned to HMAS *Stirling* base after being deployed for nine months.

Commander Submarine Force, Captain Matt Buckley, described the event as "the longest single deployment for a Collins-class Submarine".

During her deployment, *Rankin* participated in Exercise Pacific Reach, the international submarine escape-and-rescue exercise, operating out of South Korea.

Captain Buckley said that *Rankin* achieved many high points, including operating out of Fleet Base East for an extended four-month period, supporting fleet exercises like Ocean Master, Dipex (dipping exercise) with the new Seahawk MH60R and providing the border fleet with visit and sea-ride opportunities.

"*Rankin* has achieved all key mission objectives, including a number of firsts for the Navy. I am extremely proud of the efforts of *Rankin's* CO and ship's company and am very thankful for the enduring support of their family and friends."

"This extended period of high-level activity has enabled *Rankin* to qualify numerous sailors and officers as submariners and provide the opportunity for on-the-job continuation training for many others" he said.

HMAS *Rankin's* role as one of the submarines deploying into the Indo-Pacific theatre in 2016 underscores a resurgent submarine force now comprising five boats in service with the Fleet Commander.

Austal's EPF 7 Completes Acceptance Trials

In June the Austal-built EFP 7, the future USNS *Carson City*, successfully completed US Navy acceptance trials. The trials, the last significant milestone before delivery, were undertaken in the Gulf of Mexico and involved comprehensive testing of the vessel's major systems and equipment by the US Navy.

"This is further evidence of the level of maturity that the EPF program has reached," David Singleton, CEO of Austal, said. "The US Navy's acceptance of our seventh EPF is a significant milestone for Austal, as the innovative platform continues to gain attention and praise from forward deployment around the world. The growing EPF fleet is adding great value to both US Navy and US Military Sealift Command operations and, with the unique ability to transport troops, vehicles, equipment and cargo quickly and cost effectively, is truly redefining naval capability."

After delivery of EPF 7 later this year, Austal will deliver a further three expeditionary fast transport vessels from its shipyard in Mobile, Alabama, under a $US1.6 billion, 10-ship block-buy contract with the US Navy. Final assembly is well underway on *Yuma* (EPF 8), and modules for *City of Bismarck* (EPF 9) are under construction in Austal's module manufacturing facility.

Expeditionary Fast Transport 7 (EPF 7), USNS *Carson City* during acceptance trials in the Gulf of Mexico (Photo courtesy Austal)

Austal Re-enters Chinese Domestic Ferry Market

On 7 June Austal announced that it is re-entering the Chinese ferry market to design and build the next generation of high-speed passenger ferries serving domestic routes in that country.

The company has signed an agreement to form a joint venture with Guangdong Jianglong Shipbuilding Company

(Jianglong Shipbuilding) of Zhuhai, China, to pursue commercial vessel opportunities which build upon Austal's long history and strong reputation in mainland China.

The Chinese passenger ferry market was Austal's first major export market and, since 1990, the company has successfully delivered 52 high-speed aluminium ferries to 20 customers in China, Hong Kong and Macau.

The Chinese government mandates a maximum operating life of 25 years for commercial high-speed ferries. As a result, Austal anticipates that all of these vessels, as well as high-speed ferries built by other manufacturers, will need to be replaced progressively during the next few years.

"This mandated fleet replacement combined with a growing domestic requirement will present a major market opportunity for Austal," said Austal's CEO, David Singleton.

"As Chinese customers are now seeking locally-built vessels, the joint venture with established local shipbuilder Jianglong will allow Austal to compete in the domestic Chinese market without the need to develop new shipyard facilities."

The joint venture, to be known as Aulong Shipbuilding Co. Ltd, will be 40 per cent owned by Austal and will build and market Austal-designed commercial aluminium vessels manufactured within Jianglong Shipbuilding's existing facilities in Guangdong province, for mainland China-based customers.

Austal will appoint the new company's General Manager, support it in delivering vessels which meet Austal's global reputation for high quality and performance, and license to the joint venture the latest in high-speed aluminium ferry designs from its established design team in Henderson.

"The Aulong JV is a great example of Australian engineers exporting Australian engineered products to one of the world's largest markets. We are combining the strength of a current high-quality shipyard in China with Austal's market-leading designs.

"The ferry market is global and we have to position ourselves accordingly. Our decision at the start of the last decade to build ferries in the USA led to our current large operational footprint in that country. China is a market in which we also need an established local presence.

"We are delighted to form this valuable, strategic partnership with leading local company Jianglong Shipbuilding and look forward to pursuing the growing number of commercial ferry opportunities in mainland China with both new and repeat customers of our high-speed craft."

Jianglong Shipbuilding has been successfully constructing steel and fibreglass vessels since 2003 and boasts a workforce of close to 1000 across two shipyards in Guandong province. Specialising in the construction of commercial passenger ferries and other small and medium-sized vessels, including luxury yachts, Jianglong Shipbuilding will bring to the joint venture modern shipbuilding facilities and a common focus on quality, customisation and customer satisfaction.

It is Austal's intention that the Aulong JV will service the Chinese market, while other international ferries are principally manufactured at the company's operations in the Philippines.

Offshore Crew Transfer Vessel Launched By Austal

Austal successfully launched Hull 392, a 70 m offshore crew-transfer vessel for Caspian Marine Services (CMS) of Azerbaijan, at the company's Henderson shipyard in Western Australia In June.

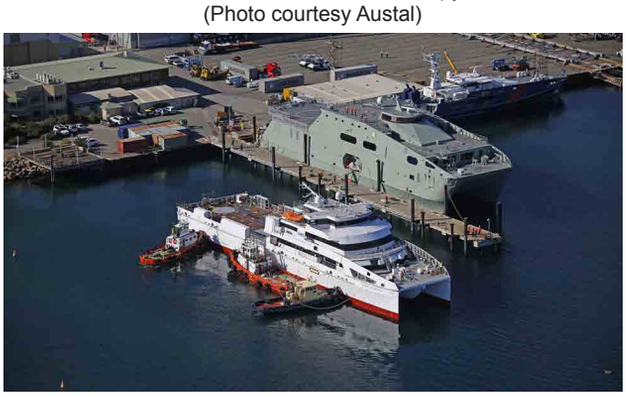
Following the contract award in June 2015, construction commenced in October 2015. In parallel with the forward hull module fabricated at Austal Philippines in Balamban, Cebu, the stern hull module and superstructure were constructed by Austal in Western Australia. In March 2016 the forward hull was transported to Henderson where the superstructure and stern were connected.

The 30 kn, 150 passenger catamaran features a 400 m^2 cargo deck and is configured to allow 'walk to work' crew transfers between vessel and offshore installations, via an Ampelmann platform.

At the vessel's launching, Austal's Chief Executive Officer, David Singleton, remarked "The on-time launch of this impressive ship further demonstrates Austal's proven, export-competitive shipbuilding capabilities into international markets and the successful integration of a global supply chain across our Philippines and Australian operations".

Based on a design by Incat Crowther, the Austal Large Crew Transfer 70 — named *Rashid Behbudov* — is on schedule for delivery to CMS in the third quarter of 2016, following final fit-out and completion of sea trials.

Austal Large Crew Transfer 70 (Hull 392) launching at Austal's Henderson Western Australia shipyard
(Photo courtesy Austal)



Austal Large Crew Transfer 70 (Hull 392) manoeuvering alongside at Austal Australia (with the Royal Navy of Oman's High-speed Support Vessel *Al Naasir* (S12) and the Australian Border Force's patrol boat *Cape Wessell* in the background)
(Photo courtesy Austal

New Export Orders for Austal

Reflecting renewed confidence and growing opportunity in the international commercial ferry market, on 20 June Austal announced two new contracts for three commercial passenger ferries with a total value of approximately $A30 million.

Firstly, Austal has been awarded a contract for the construction of a 50 m high-speed passenger catamaran for Seaspovill Co. Ltd, which operates a number of high-speed ferries on multiple domestic routes in South Korea.

With a contract value of approximately $A16 million, Austal will construct the catamaran to an Incat Crowther design which has the capacity to carry up to 450 passengers at speeds of up to 40 kn.

As many South Korean passenger ferry operators seek proven international shipbuilders to help deliver a generational update of the country's passenger ferry fleets, Seaspovill has selected Austal to build their new ship based on continued satisfaction with their pre-owned 48 m high-speed catamaran, *Seastar 3*, built by Austal in 1998. This vessel continues to impress and is performing well with a high-quality, robust construction and practical design.

The new 50 m high-speed catamaran will be constructed by Austal Philippines in Balamban, Cebu, with delivery anticipated in June 2017.

Austal has also been awarded a contract from Supercat Fast Ferry Corporation (SFFC) of the Philippines, for two 30 m passenger catamaran ferries. A subsidiary of leading Philippines transportation and logistics company, 2Go Group

The 50 m high-speed catamaran to be built by Austal Philippines for Seaspovill (Image courtesy Incat Crowther)

Inc., SFFC has awarded Austal a $A13 million contract which includes the provision of spares.

Transporting up to 300 passengers each at up to 25 kn, the two catamarans will join SFFC's popular 'Supercat' fast ferry fleet operating between 10 ports throughout the Philippines archipelago.

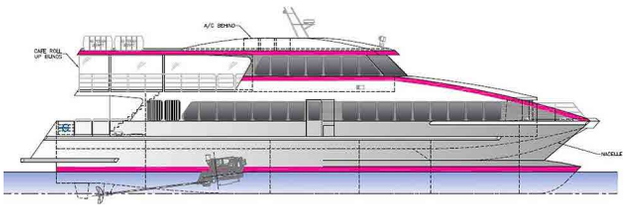
Construction of the two Incat-Crowther designed vessels will also take place at Austal Philippines and delivery is scheduled for June 2017.

Announcing the contracts, Austal's Chief Executive Officer, David Singleton, said that the two contracts were significant in many ways, with the two SFFC vessels representing Austal Philippines' first new-build program for the Philippines domestic market and the Seaspovill contract Austal's first new build for South Korea.

"Once again, Australian ship design and reputation for performance and quality wins out in the highly-competitive international shipbuilding market. Austal has a world-class reputation for high-speed ferries and naval vessels which continues to be recognised and brings quality work to the business. We are seeing a resurgence in the passenger ferry

market worldwide which Austal is well placed to win", Mr Singleton added.

Since 2013 Austal Philippines has constructed nine ships and collaborated with Austal Australia on a further two ship programs. Deliveries have included wind-farm service vessels, high-speed offshore crew-transfer vessels, and the largest-ever vehicle passenger ferry built in the Philippines — the 80 m *Aremiti Ferry 2* for SNC Aremiti Ferry of French Polynesia.



The two 30m passenger catamarans for Supercat Fast Ferry Corporation will be the first vessels built by Austal Philippines for the local market. (Image courtesy Incat Crowther)

Second 70 m Catamaran Crewboat from Incat Crowther

Incat Crowther has announced that construction is well advanced on a second 70 m catamaran crewboat sister vessel to *Muslim Magomayev*. *Muslim Magomayev* is a first-of-type vessel which Incat Crowther developed in close conjunction with Caspian Marine Services. Incat Crowther has undertaken extensive support work in the field, including involvement in engineering for the fitting of an Ampellmann walk-to-work stabilised access platform, making it the first catamaran to have such a system and its structure fully integrated into its design.

The operational success of the vessel led CMS to order a second vessel, which was launched recently at Austal Ships' Western Australian shipyard (see Page 18). Incat Crowther has worked with Austal to provide an extensive list of design deliverables for the project, including naval architecture and detailed construction drawings with cutting and nesting data.

Muslim Magomayev, built by Incat Tasmania, holds station using dynamic positioning (DNV GL notation DYNPOS-AUTR) whilst the access system compensates for the vessel's motion by using a control system linked to hydraulic cylinders. Crew transfers can be performed with a 98.5% uptime in prevailing conditions.

The second vessel will feature incremental improvements on *Muslim Magomayev*, featuring Incat Crowther's semi-SWATH hull form, optimised for high-speed transits with a maximised operability envelope and low incidences of sea sickness. The design was developed using Incat Crowther's in-house CFD and seakeeping expertise, and validated using industry-leading tank testing and proven in service by *Muslim Magomayev*. The design also utilises a resiliently-mounted main cabin and machinery system, extensive vibration isolation and an active ride-control system.

The vessel will retain *Muslim Magomayev*'s cornerstone flexibility, with 275 m^2 of cargo decks space, 130 t cargo capacity and a range of 400 n miles.

Passengers are accommodated on both the main deck and mid deck, with the mid deck featuring crew accommodation for 16. All crew cabins offer excellent comfort and are ILO-compliant. The main deck also features VIP rooms, vending machines, luggage space and a large workshop.

The vessel is fully-compliant with the IMO HSC code, is DP2 classed, provides an excellent stable platform for transfers and performs exceptionally in all sea conditions.

Construction is well progressed, with the superstructure and hull modules recently being united at the shipyard prior to being inspected by the Australian Prime Minister, Malcolm Turnbull, on the campaign trail.

Muslim Magomayev has proven herself invaluable in the Caspian area, recently rescuing more than 30 personnel from an emergency situation aboard an offshore platform in hazardous sea conditions.

Principal particulars of the new vessel 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	16
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
Generators	4×CAT C18 ACERT each 550 ekW
Bow thrusters	4×TH300MLR azimuthing retractable
Speed (service)	30 kn
(maximum)	38 kn
Dynamic positioning	Kongsberg K-Pos DP-21
Crew transfer	Walk-to-work stabilised access platform
Cargo handling	Frog-9 Crane-lifted rigid basket Palfinger PK4500M knuckle-boom crane
Safety Equipment	6-person MOB Boats 2×200 pax Liferafts 2×100 Pax MES
Ride control	Active T-foil, interceptors and yaw stabilizers
Construction	Marine-grade aluminium
Flag	Azerbaijan
Class/Survey	✠1A1 DNV GL HSLC Passenger, R1, EO, DYNPOS-AUTR, CLEAN-DESIGN, COMF-V(3) C(3), NAUT-HSC, NAUT-OSV(A)

The new catamaran crew boat for Caspiaan Marine Service after launching at Austal's Western Australian shipyard
(Photo courtesy Austal)

Majestic 7 from Incat Crowther

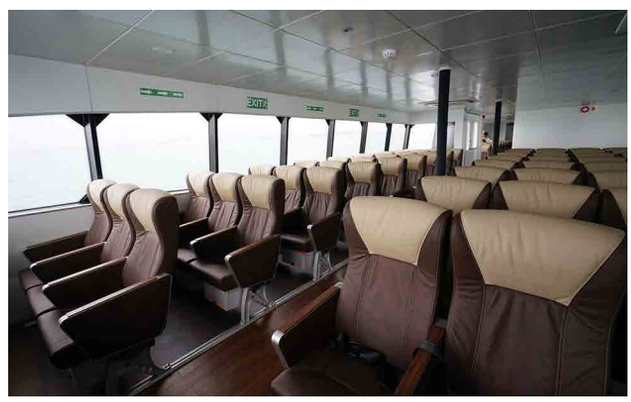
Incat Crowther has announced the launch of *Majestic 7*, the first of four high-speed catamaran passenger ferries to be delivered to Majestic Ferries in Singapore. Built at PT Cahaya Samudra Shipyard in Indonesia, the 200-passenger 33 m vessel will operate between Singapore and Batam. The vessel gives the operator increased capacity and speed at a fraction of the fuel consumption of the current competitors.

All of *Majestic 7*'s 200 passengers enter through midship boarding doors and sit in forward-facing seats. In addition, there are four seats for crew members. At the aft end of the cabin are a 6-person crew room and kiosk, as well as three heads. The upper deck, free of passengers, features just the wheelhouse with excellent all-round visibility. The vessel is built to the HSC 2000 code under Bureau Veritas survey.

Powered by a pair of MAN D2862 LE463 main engines, each rated at 1029 kW driving fixed-pitch propellers, *Majestic 7* performed well in sea trials, reaching a loaded speed in excess of 30 kn. The vessel will be operated at a service speed of 28 kn at a reduced MCR.

Majestic 7 is part of a multiple-vessel order which has been further expanded to include a pair of larger-capacity vessels due to be launched in late 2016.

Majestic 7 on trials
(Photo courtesy Incat Crowther)



Seats in the passenger cabin on *Majestic 7*
(Photo courtesy Incat Crowther)

Principal particulars of *Majestic 7* are

Length OA		33.0 m
Length WL		32.7 m
Beam OA		8.50 m
Depth		2.80 m
Draft	(hull)	1.20 m
	(propeller)	1.96m
Passengers		200
Crew		8
Fuel oil		7000 L
Fresh water		2000 L
Sullage		1000 L
Main engines		2×MAN D2862 LE463 each 1029 kW @ 2100 rpm
Propulsion		2×5-bladed fixed-pitch propellers
Generators		2×Perkins 4.4W2GM 50 Hz
Speed	(service)	28 kn
	(maximum)	31 kn
Construction		Marine-grade aluminium
Flag		Singapore
Class/Survey		BV 1 ✠Hull ✠Mach HSC Category A Sea Area 2

Rapido Gee from Incat Crowther

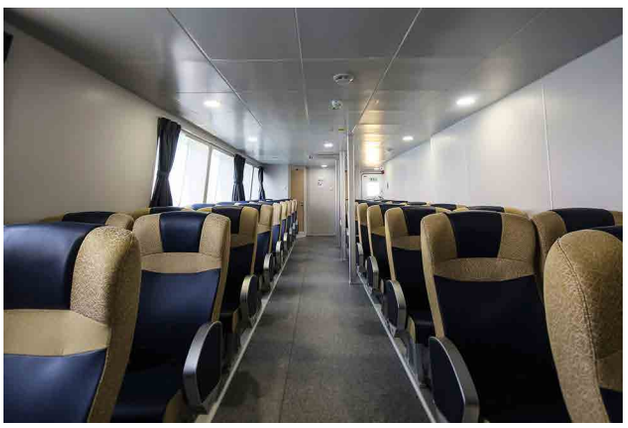
Incat Crowther has announced the delivery of *Rapido Gee*, a 42 m steel monohull utility vessel. Built by Strategic Marine, *Rapido Gee* is a further development of the design used for the successful ten-vessel fleet of Infield Utility Vessels delivered by Strategic Marine last year.

Currently in transit to the Middle East, *Rapido Gee* will be operated by Rashied Marine Services in the service of offshore platforms. In response to calls for construction simplicity, Incat Crowther re-engineered the vessel with mild steel used in the hull in place of the original high-tensile steel. The result is reduced material cost and material lead times, with only minor impact on the vessel's performance.

Rapido Gee features a 100 m^2 aft working deck, with 40 t cargo capacity. Stern and bow platforms are fitted for personnel transfers.

The main-deck cabin seats 40 personnel, as well as accommodating 100 survivors in the event that the vessel is called into an emergency situation. A sick bay is also located on this deck, as are a galley, crew mess and food storage for the vessel's 14 crew.

Rapido Gee on trials
(Photo courtesy Incat Crowther)



Seats in the cabin on *Rapido* Gee
(Photo courtesy Incat Crowther)

Rapido Gee's crew sleep below decks, with an acoustic lock/service void separating them from the engine room to minimize transfer of noise and vibration to the accommodation spaces.

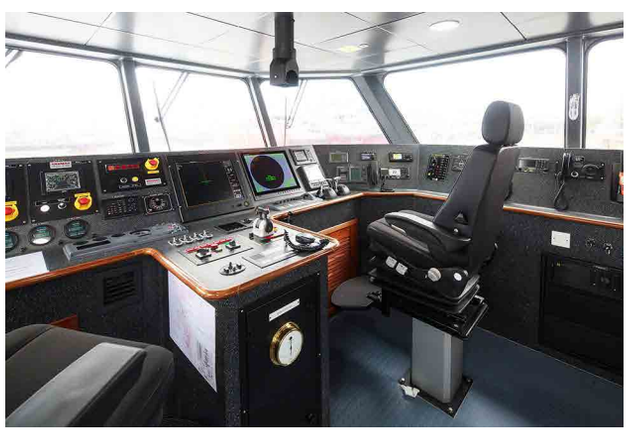
The vessel's propulsion system consists of a trio of Yanmar 12AYM-WET main engines, with the centre one driving a fire pump. Propulsion is by fixed-pitch propellers through ZF gearboxes. *Rapido Gee* has a service speed of 20 kn.

The vessels are classed by Lloyd's Register and designed to the SSC Rules.

Principal particulars of *Rapido Gee* are

Length OA		42.0 m
Length WL		40.5 m
Beam OA		8.00 m
Depth		3.65 m
Draft	(hull)	1.90 m
	(propeller)	2.80 m
Personnel		50
Crew		14
Survivors		80
Fuel oil		13 000 L (day tanks) 67 000 litres (long range tanks)
Fresh water		31 000 L
Sullage		3000 L
Oil dispersant		1000 L
Deck cargo		40 t
Deck area		100 m^2
Deck load		3.5 t/m^2
Main engines		3×Yanmar 12AYM-WET each 1140 kW @ 1900 rpm
Propulsion		3×fixed-pitched propellers
Generators		2×Yanmar 6HA2-WDT each 336 kW
Speed	(service)	20 kn
	(maximum)	22 kn
Construction	(hull)	Steel hull
	(superstructure)	Marine-grade aluminium
Flag		Jordan
Class/Survey		LR ✠100A1 SSC Workboat Monohull G3 ✠MCH

Rapido Gee testing fire pumps
(Photo courtesy Incat Crowther)



Wheelhouse on *Rapido* Gee
(Photo courtesy Incat Crowther)

Starboard quarter of *Rapido* Gee
(Photo courtesy Incat Crowther)

Ratayapibanbancha and *Arcarachwaratorn* from Incat Crowther

Incat Crowther have announced the delivery of *Ratayapibanbancha* and *Arcarachwaratorn*, a pair of 24 m catamaran patrol boats. Built by the Bangkok-based Seacrest Marine within a demanding delivery schedule, delivery of the vessels closes a capability gap identified by the Royal Thai Police.

Ratayapibanbancha and *Arcarachwaratorn* are based on the innovative *Reef Ranger* which was designed by Incat Crowther and commenced operation as a patrol boat on Australia's Great Barrier Reef in 2014. The platform has demonstrated superior operating characteristics in service and was identified as capable of meeting the mission demanded by the Royal Thai Police.

A large aft working deck houses a 4.5 m fast rescue craft, forward of which is the main-deck cabin. The cabin has a fully-featured galley to starboard and a wet room to port. Forward of the hull access are two large rooms, one a dormitory for eight crew, the other a large mess and dining space.

Upstairs are two large cabins with ensuites for senior officers in addition to a private living area. The wheelhouse features a lounge and forward-raked windows affording excellent visibility. Doors from the wheelhouse provide direct access to the foredeck stairs.

Below decks is a pair of cabins for additional crew, as well as equipment, pump rooms and storage spaces.

Ratayapibanbancha and *Arcarachwaratorn* will perform a multitude of functions which fall under the jurisdiction of the Royal Thai Police. These include border protection, general and long-range patrol duties, and transporting dignitaries. To

this end, the vessels have been configured to be versatile and fully-featured, including comprehensive communications equipment and office facilities. The interior spaces of the vessel are well fitted out with high-quality, durable materials appropriate for the operation.

The vessels' engineering-system installations reflect careful attention to detail. The application of underwater main-engine exhaust outlets ensures very low ambient noise levels throughout the vessels and surrounding environment.

The vessels are powered by twin MAN 12V D2862 main engines, each producing 1213 kW and feature Humphree interceptors. The vessels performed well in sea trials, achieving a loaded speed of 32 kn. They are capable of a maximum speed of 34 kn and a range of 1000 n miles at cruising speed.

Principal particulars of *Ratayapibanbancha* and *Arcarachwaratorn* are

Length OA		26.2 m
Length WL		24.7 m
Beam OA		8.50 m
Depth		3.40 m
Draft	(hull)	1.15 m
	(propeller)	1.50 m
Crew		2 + 12
Fuel oil		7600 L (long range) 1200 L (day tanks)
Fresh water		2500 L
Sullage		2000 L
Main engines		2×MAN 12V D2562 LE453 each 1213 kW @ 2300 rpm
Propulsion		2×propellers
Generators		2×Deutz BF4M 1013MC each 97 kWe
Speed	(service)	32 kn
	(maximum)	34 kn
Construction		Marine-grade aluminium
Flag		Thailand
Class/Survey		Bureau Veritas

Starboard bow of *Arcarachwaratorn*
(Photo courtesy Incat Crowther)

Fleet of 26 m Catamaran Passenger Ferries from Incat Crowther

Incat Crowther has announced the design of a new fleet of vessels for Hornblower, the selected operator of New York City's new Citywide Ferry Service. Hornblower is a worldwide leader in hospitality and maritime services, offering commuter ferries, dining cruises and sightseeing products across North America.

In an ambitious undertaking announced by New York City Mayor, Bill de Blasio, New York City will create a network of ferries serving the entire city by the end of 2018 with a focus on areas which are currently underserved by transit. The new service includes longer runs to the Rockaways in 2017, along with South Brooklyn and Astoria. Service to the Lower East Side in Manhattan and Soundview in the Bronx will begin in 2018.

Incat Crowther is already delivering production engineering to satisfy an aggressive build schedule at multiple shipyards, with at least a dozen boats scheduled to be delivered in 2017.

Grant Pecoraro, General Manager of Incat Crowther's North America office, said "Incat Crowther is proud to be involved in such a significant project in one of the busiest cities in the world. We look forward to solidifying our position as a world leader for vessel designs in this type of operation."

Incat Crowther was selected because of their specialisation and vast experience in naval architecture and design of efficient passenger ferries," noted Junior Volpe, Director of Special Projects for Hornblower.

The 150-passenger vessels will have spacious interiors, with ADA access, wide aisles, a concession stand and wi-fi.

The design features bow loading specifically designed to integrate with standard infrastructure, some of which will be built or redeveloped for this project. The foredeck also houses bicycle racks and room for strollers.

The design has been developed in close co-operation with Hornblower, leveraging Incat Crowther's experience and expertise in the US ferry industry to satisfy challenging operational and regulatory requirements. Key attributes include low wash, high fuel efficiency and low emissions, cold water operation and the robustness to reliably service a high-frequency commuter operation, estimated to service 4.6 million passenger trips per year once the service reaches its full potential.

Starboard bow of 26 m New York ferry
(Image courtesy Incat Crowther)

The vessels will form the backbone of a modern, comfortable and efficient urban ferry fleet which will be New York City's first city-wide ferry system in over 100 years.

Principal particulars of the new vessels are

Length OA		26.0 m
Length WL		24.5 m
Beam OA		8.00 m
Depth		2.70 m
Draft	(hull)	1.00 m
	(propeller)	1.85 m
Passengers		150
Crew		2
Fuel oil		5680 L
Fresh water		757 L
Sullage		1900 L
Main engines		2×Baudouin 6M26.3 P3 each 599 kW @ 2100 rpm
Propulsion		2×5-bladed propellers
Generators		2×RA Mitchell Custom Built
Speed	(service)	25 kn
	(maximum)	27 kn
Construction		Marine-grade aluminum
Flag		United States
Class/Survey		USCG Subchapter T

Stewart Marler

Port quarter of 26 m New York ferry
(Image courtesy Incat Crowther)

Glenn Autrey from Incat Crowther

Incat Crowther has announced the recent delivery of *Glenn Autry*, a 63 m aluminium monohull crew-supply vessel, for Barry Graham Oil Service (BGOS) of Bayou La Batre, Alabama, USA. Built to a high-quality standard by Halimar Shipyard in Morgan City, Louisiana, the project's successful completion is the result of a close collaboration between operator, shipyard, and designer which originated with the build of a sister vessel, *John Jacob,* delivered by Halimar to BGOS in 2014.

Driving factors in the design-and-build process included Halimar Shipyard and Incat Crowther providing a modern and fuel-efficient design meeting the latest demands of crew-supply vessels in the Gulf of Mexico while preserving the continuity of the existing BGOS fleet.

Key features of *Glenn Autry* include a vast aft cargo deck of nearly 340 m^2 which carries loads of up to 457 t.

The main-deck cabin houses 72 passenger seats, a passenger shower and toilet, stores, a dedicated DP equipment room, and access to the upper-deck wheelhouse and below-deck accommodation. A deck locker, accessed from the cargo deck, is provided for storage of deck-cargo securing equipment and other safety gear. The wheelhouse features both forward- and aft-facing control stations with sharply designed control consoles.

Below deck, *Glenn Autry*'s crew members are accommodated in twin cabins, capable of sleeping a total of 12. Adjacent to these cabins is a crew galley and mess area, as well as a large pantry.

The vessel's hull houses a multitude of tanks. In addition to the vessel's 57 900 L of fuel, 66 284 L of transferrable fuel can be carried. Additional tanks hold the vessel's fresh water, grey water, and sewage, while dual-purpose water tanks can also be used to carry up to 161 200 L of rig or ballast water.

The vessel is powered by a quartet of Cummins QSK 50 EPA Tier III diesel engines, each rated at 1342 kW. These engines are driven through Twin Disc MGX 6848 gearboxes to four Hamilton HM811 waterjets via cardan shaft assemblies from Driveline Service of Portland. These engines powered *Glenn Autry* to a top speed of 35 kn during acceptance trials.

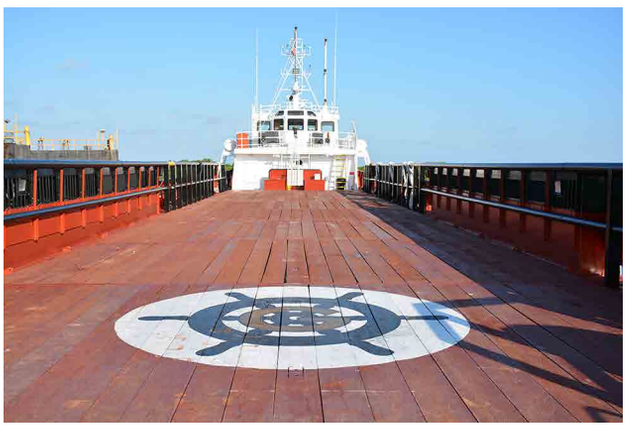
The vessel is USCG Subchapter T certified and ABS classed for DP-2 service. Three Thrustmaster 112 kW tunnel bow thrusters combine with the four jets and a Beier Radio DP-2 control system to give the vessel superior manoeuvrability. Electric power is generated from three Cummins QSB7-DM gensets rated at 185 kWe.

Additionally, a FiFi-1 firefighting system is installed for the purpose of combatting off-ship fires. The system includes two FFS engine-driven pumps, each with 20 kL/min capacity, with integral clutch assemblies and remote controlled monitors.

Principal particulars of *Glen Autrey* are

Length OA	62.6 m
Length WL	55.2 m
Beam OA	9.80 m
Depth	4.60 m
Draft (hull)	2.30 m
Passengers	72
Crew	12
Ship's fuel oil	57 900 L
Cargo fuel oil	66 200 L
Ship's fresh water	4920 L
Ballast water	73 220 L
Rig water	161 200 L
Grey water	2340 L
Sullage	2120 L
Deck area	340 m^2
Deck cargo	457 t
Main engines	4×Cummins QSK 50 each 1342 kW @ 1900 rpm
Propulsion	4×Hamilton HM811 Waterjets
Bow Thrusters	3×Thrustmaster 30TT150AL
Generators	3×Cummins QSB7-DM each 185 kWe @ 1800 rpm
Speed (maximum)	35 kn
Construction	Marine-grade aluminium
Flag	USA
Survey	USCG Subchapter T
Class	ABS ✠A1 HSC Crewboat ✠AMS ✠DPS-2

Port quarter of *Glenn Autrey*
(Photo courtesy Incat Crowther)



Aft deck on *Glenn Autrey*
(Photo courtesy Incat Crowther)

Hezekiah and *Lady Dora* from Incat Crowther

Incat Crowther has announced the successful completion of *Hezekiah* and *Lady Dora*, two 35 m offshore security patrol vessels. The vessels are classed by Bureau Veritas and were constructed by Veecraft Marine in Cape Town, South Africa, for an undisclosed client in Lagos, Nigeria.

The vessels are slated to provide surveillance, intervention and protection to offshore assets of the Nigerian AGIP Exploration (NAE) located in the Gulf of Guinea. The vessels are also capable of providing replenishment of crews, fuel, and potable water to the NAE offshore facilities.

Propulsive power for the vessels is supplied by three Caterpillar C32 ACERT engines, each producing 1081 kW at 2300 rpm, driving Teinbridge fixed-pitch propellers through ZF 3050 gearboxes. The vessels have a service speed of 25 kn. Electrical power is provided by two Caterpillar C4.4 generators and manoeuvrability is enhanced by a Hydro Armor Type 800 bow thruster.

The efficiently-arranged accommodation provides generous space for a complement of 22 crew and security personnel as well as 15 passengers. Included in the accommodation are eleven staterooms, five heads, a medical room, galley, crew lounge, mess area, laundry space, and a walk-in cooler. External decks provide plenty of space for transportation of supplies and include armoured positions for weapons installations. The aft portion of the hull is fitted with an integrated RHIB well with a hydraulically-actuated transom door for easy deployment of an 8 m fast rescue craft. The pilothouse is constructed of ballistic resistance steel and windows to provide protection to NIJ Level III.

The design of *Hezekiah* and *Lady Dora* is another testimony to the relationship between Incat Crowther and Veecraft Marine. A commitment to service and innovation has led to yet another bespoke design suited to meet the growing need for offshore oil and gas security vessels.

Principal particulars of *Hezekiah* and *Lady Dora* are

Length OA		35.0 m
Length WL		35.0 m
Beam OA		7.00 m
Depth		3.80 m
Draft	(hull)	2.00 m
	(propeller)	2.30 m
Passengers		22
Crew		15
Fuel oil		46 500 L
Fresh water		22 000 L
Sullage		1600 L
Main engines		3×Caterpillar C32 ACERT each 1081 kW @ 2300 rpm
Gearboxes		3×ZF 3050
Propulsion		3×Teignbridge propellers
Generators		2×Caterpillar C4.4
Speed	(service)	25 kn
	(maximum)	28 kn
Construction		Marine-grade aluminium
Flag		Nigeria
Class/Survey		BV ✠Hull Machinery Crewboat Sea Area 2

Zach Dubois

Hezekiah on trials
(Photo courtesy Incat Crowther)

John Oxley Restoration

Restoration of Sydney Heritage Fleet's *John Oxley* is proceeding, with the hull re-plating complete, and work now progressing on the superstructure. The main deck above the engine room has been replaced, and the funnel, wheelhouse and bridge deck have been removed for restoration, making work in progress obvious to commuters on Victoria Road. Work is also proceeding on the main deck aft, and the engineer's cabins on the port side.

For all the details and photographs of progress, visit http://johnoxley.org.au/latest-update/previous-news-items/.

Phil Helmore

FROM THE CROWS NEST

Searoad Launches new Era in Bass Strait Shipping

Tasmania's clean, green image received a very practical boost on 3 July with the launch of SeaRoad Shipping's new roll-on roll-off freight vessel for Bass Strait service. *Searoad Mersey II*, powered by liquefied natural gas, was officially christened by Robyn Kelly, wife of Chas Kelly, Chairman of parent company SeaRoad Holdings, at the renowned Flensburger Schiffbau Gesellschaft in Flensburg, Germany

Searoad Mersey II represents an investment of more than $110 million in the future of Tasmania and its connectedness to the mainland and the world. She is the first coastal ship in Australia to use clean, green LNG fuel-and-power technology and the first pure dry cargo ship globally to use a roll-on roll-off LNG supply system. She will also be the first new vessel this century specifically designed and commissioned for the Bass Strait trade.

All of the ship's principal engines are dual-fuel, burning LNG as the primary source of energy to give significantly reduced emissions, minimal risk of oil pollution, greater operational efficiencies and sustainable future environmental benefits. In regular service *Searoad Mersey II* will use diesel for less than one percent of ship operations.

The innovative design anticipates strict marine air-pollution regulations which already apply in parts of Europe and North America and which are likely to be enacted in Australia in the future.

Importantly, *Searoad Mersey II* is significantly larger and faster than the namesake vessel she replaces, adding critical capacity for Tasmanian exporters (and importers) as the Bass Strait freight task continues to grow.

Chas Kelly believes that there couldn't be a better ambassador for Tasmania's clean, green image. "This is a Tasmanian-grown project that ticks the right boxes about environmental responsibility, clever thinking, world-leading technology and commercial sustainability," Mr Kelly said. "SeaRoad customers will be able to tell their own clients that the produce, goods and equipment they're shipping to or fromTasmania will be transported by the most environmentally efficient method. Clean and green not only defines Tasmania, it ships from here too. We couldn't be more proud."

Searoad Mersey II being launched
(Photo from Searoad Holdings website)

Following launching, *Searoad Mersey II* will undergo several more months of completion work and trials before voyaging to Australia in late October. She is expected to enter six-days-a-week overnight Bass Strait service between Devonport and Melbourne in December.

There is a video of the launching ceremony at www.searoadholdings.com.au/srwebsite/movies/MerseyII.mp4.

Principal particulars of *Searoad Mersey II* are

Length OA		181.5 m
Beam (mld)		26.60 m
Draft		6.35 m
Depth	Main Dk	8.90 m
	Weather Dk	17.60 m
Deadweight		8500 t
Cargo deadweight		6750 t
Cargo type		Containers, trailers, cars and other mobile or wheeled freight
Lane length		1960 m + cars
Reefer points		150
Cargo Access		2 × Stern ramp/doors (one to main deck and lower hold and one to upper weather deck)
Main Engines		2×MaK M46DF each 7200 kW
Auxiliary Engines		2×MaK M34DF each 3600 kVA
Fuel		LNG plus 1% MDO pilot fuel
Propulsion		2×controllable-pitch propellers
Steering		2×full-flow twisted rudders with Costa bulbs
Manoeuvring		2×Bow thrusters
Service speed		20.5 kn
Classification		DNV GL
Flag		Australia

Searoad, *Press Release,* 3 July 2016

Our Princess Mary Names *Stenaweco Impulse*

Newly-built chemical and product tanker, *Stenaweco Impulse*, was named by HRH Crown Princess Mary of Denmark, who broke a bottle of champagne against the tanker's bow and wished the vessel, her captain and his crew, fortune and prosperity.

Named on 13 June at a ceremony at Langelinie Pier in the centre of Copenhagen, *Stenaweco Impulse* is the newest vessel owned by Stena Weco, a joint venture between Swedish Stena Bulk and Danish Weco Shipping for the transport of vegetable oils, chemicals and petroleum products.

Stenaweco Impulse, of length 183 m, beam 32 m and deadweight 50 000 t, is the sixth in a series of 13 IMOIIMAX MR tankers ordered and will trade in Stena Weco's global logistic system, which includes more than 60 vessels.

Erik Hånell, President and CEO of Stena Bulk and CEO of Stena Weco, said "We are very proud of our IMOIIMAX fleet with six vessels delivered so far. The concept, with its innovative design, has already proved to be very successful,

as has the operative collaboration with Weco Shipping, which was formed five years ago."

"*Stenweco Impulse* has given our collaboration with Stena Bulk a new dimension as we now also have a jointly-owned vessel," said Johan Wedell-Wedellsborg, chairman of Weco Shipping. "I am, naturally, extra proud that the naming ceremony took place in Copenhagen with HRH Crown Princess Mary of Denmark as the godmother. We look forward to a continuing healthy and positive development of Sten Weco together with Stena Bulk."

Technical design for the IMOIIMAX vessels, a further development of an already established concept, has been developed by Stena Teknik together with the Chinese shipyard Guangzhou Shipbuilding International, offering large cargo flexibility, a high level of safety and 10–20% fuel consumption saving when sailing at service speed, Stena Weco said.

Stena Impression, Stena Image, Stena Imperial and *Stena Important* were delivered in 2015, and *Stena Imperative* in January 2016. The remaining six vessels after *Stenaweco Impulse* will be delivered every third month, and the last vessel in 2018. Three of the 13 IMOIIMAX tankers are wholly owned by Stena Bulk, six together with Golden Agri Resources, two by Stena Bulk's sister company, Concordia Maritime, and two by Stena Weco.

www.marinelink.com, 15 June 2016

Princess Mary names *Stenaweco Impulse*
(Photo courtesy Stena Weco)

Container Mass Regulations

The Australian Maritime Safety Authority (AMSA) has implemented the International Maritime Organisation's changes to shipping regulations as of 1 July. The changes relate to the container mass verifications in the shipping industry, requiring shippers to provide a verified gross mass (VGM) for containers. Under the changes, the shipper is required to provide a signed VGM to the terminal and the master of a vessel or their representative, in advance of the container being loaded.

Providing a VGM for the container allows the master of a vessel to plan ship loading so that the ship is stable, hull strength and stack masses are not exceeded, and lashing arrangements are effective.

AMSA's Chief Executive Officer, Mick Kinley, said that the need for accurate mass declarations is a critical issue. "These amendments to the International Convention on Safety of Life at Sea (SOLAS) will improve safety in global shipping, and AMSA is pleased to be playing its part in ensuring a safe industry for all."

Australian legislation has required shippers to provide an accurate gross mass on maritime shipping documents since 1994, so many shippers will already comply with the new requirements.

Ausmarine, July 2016

World Water Speed Record

Ken Warby still holds the World Water Speed Record which was set in *Spirit of Australia* on Blowering Dam, NSW, on 8 October 1978 at 511.11 km/h. *Spirit* is now on permanent display in the Australian National Maritime Museum.

Ken Warby prepares to break the World Water Speed Record in *Spirit of Australia* on Blowering Dam on 8 October 1978
(Photo from Warby Motor Sport website)

Ken, together with son David, started construction of a new boat, *Aussie Spirit,* in the early 1990s and continued to build it in his spare time while still managing his business. At the time of construction, the Union Internationale Motonautique (UIM) rules didn't require an unlimited water speed record boat to have a reinforced safety cockpit, but Ken wanted to build one anyway. Being a mechanical engineer and an experienced drag-car driver and builder, he constructed a chrome-moly tubed cockpit, and covered it in carbon fibre which made it practically bullet proof. However, by the time *Aussie Spirit* was ready to run on the water, the new UIM cockpit rules had been enforced for unlimited water speed record craft. This meant that test samples of a cockpit structure had to be tested before the boat was built. As the *Aussie Spirit* cockpit was part of the main structure, removing it was not an option. With Blowering Dam at an all-time low of 15% capacity in 2005, a new World Water Speed Record was out of the question, but Ken did make improvements to the way the boat planed and handled, and then did demonstration runs in Australia and USA as part of the John Haggin's AMF offshore Team.

To comply with the new UIM cockpit rules, Ken and son David are now well advanced in the construction of another boat, *Spirit of Australia II*. This boat will be powered by a Rolls-Royce Orpheus 803 jet engine, which is lighter and delivers more power than the Westinghouse J-34 jet engines which powered *Spirit of Australia* and *Aussie Spirit.* The

team has now completed the fit out of *Spirit II*, which has been put onto its new tri-axle trailer, and is ready for final painting. The team hope to test fire the engine in September, and then *Spirit of Australia II* will be ready for low-speed runs and system tests on the river at Taree around January 2017, with more-serious runs later on Blowering Dam, which is currently at about 70% capacity.

For all the details of Ken's boats (and other high-performance toys!), and to follow the progress of *Spirit of Australia* II, visit www.warbymotorsport.com.

Spirit of Australia II in June 2016
(Photo from Warby Motor Sport website)

Time-Lapse Video of Construction and Christening of *AIDAprima*

AIDAprima is the flagship of AIDA Cruises, built by Mitsubishi Shipbuilding at their shipyard in Nagasaki, Japan. The ship was christened on 7 May 2016 in Hamburg, Germany, as part of the 827th Hamburg Port Anniversary.

AIDAprima is the largest cruise ship in AIDA cruises fleet, with an overall length of 300.0 m, moulded beam of 37.60 m, maximum draft of 8.00 m and gross tonnage of 124 700. The vessel has a capacity of 3300 passengers and 900 crew members, with 18 passenger decks, 15 dining options, indoor and outdoor pools, as well as shops, cafes, and bars.

The AIDA Beach Club pool area, which is covered by a transparent UV-permeable membrane dome, allows passengers to relax in a beach setting with natural light despite inclement weather. The Beach Club features the longest indoor water slide on a cruise ship, a rock-climbing wall, and a lazy river. At night, the Beach Club serves as a discotheque, with stars or laser shows projected onto the dome.

AIDAprima is driven by three MaK 12V M43C diesel engines and one MaK M46DF dual-fuel (LNG/oil) engine, which deliver 39 634 kW to the propulsion system. The engine has computer-controlled fuel injection to increase fuel economy. The ship is propelled by ABB Azipod XO units, which allows a service speed of 22 kn.

AIDAprima uses Mitsubishi Heavy Industries's proprietary Mitsubishi Air Lubrication System (MALS), which releases small air bubbles to cover the bottom of the vessel, reducing the friction between the hull and the surrounding water. This is predicted to reduce CO_2 emissions and fuel consumption by more than 7%.

For further details, check https://en.wikipedia.org/wiki/AIDAprima, or search for AIDAprima on the web. The Vesselfinder website also gives her current position.

AIDAprima
(Photo from en.wikipedia.org)

There is an excellent time-lapse video of the vessel's construction and christening on YouTube at https://youtu.be/lavm7CausyA.

Phil Helmore

Low-sulphur Fuel for Cruise Ships in Sydney Harbour

Fulfilling a 2015 election commitment, the NSW Government introduced regulatory requirements for the use of low-sulphur fuel (0.1 per cent or less) by cruise ships in Sydney Harbour. The requirements addressed community concerns raised about emissions from cruise ships, in particular by residents living near the White Bay Cruise Terminal.

The Commonwealth government introduced amendments to the *Protection of the Sea (Prevention of Pollution from Ships) Act 1983* effective January 2016. Having received legal advice recently, it is now clear to the NSW Government that these changes made the NSW low-sulphur requirements inoperative.

After the federal election, the NSW government will ask the incoming Commonwealth government to consider legislation which will allow for the operation of the low-sulphur fuel laws. The NSW Government also plans to extend the operation of its low-sulphur requirements to cruise ships in regional ports, consistent with its election commitment.

In the interim, both Carnival Australia and Royal Caribbean have agreed to comply voluntarily with the NSW low-sulphur fuel requirements whilst at berth.

Mark Speakman
NSW Minister for the Environment, 24 June 2016

MIT Free Courses Online

Massachusetts Institute of Technology offers free (by donation) courses online in many engineering and science areas, and some naval architecture courses are included.

Check out the offerings at http://ocw.mit.edu/courses/.

Hugh Hyland

Navigation Accidents and their Causes

The Nautical Institute's latest book, *Navigation Accidents and their Causes*, looks at major casualties and the lessons which can be learned, setting out good practice to avoid them in future. The book, launched in September 2015, examines nearly 30 casualties and the problems of fatigue, bridge resource management, Colregs and other issues where human factors contributed to the accidents.

In his foreword to the book, Koji Sekimizu, Secretary-General of the International Maritime Organization, said "This timely publication from The Nautical Institute should provide a crucial guide for every mariner serving at sea and serve to assist in reducing collisions and groundings. The publication is written in maritime English for international mariners. Each chapter can be read individually, thus forming a valuable onboard resource."

An international group of authors, including accident investigators, master mariners, navigation specialists and university lecturers, used their experience and knowledge to look at the mistakes which have led to collisions and groundings [*Including a chapter on under-keel clearance by Tim Gourlay from Curtin University* — Ed.]. Previous casualties have been used to illustrate where failures have occurred and lessons which can be learned. The need for

risk assessment in advance of a voyage is highlighted in many ways, including bridge resource management and passage planning.

The authors looked into the future to identify trends which may impact on navigational risk and suggest ways to mitigate them. This innovative approach goes beyond the scope of *Collisions and their Causes* and *Strandings and their Causes*, both previously published by The Nautical Institute and written by the late Captain Richard Cahill. While *Navigation Accidents and their Causes* examines failings which Cahill identified so clearly, it goes further by suggesting onboard training and mentoring as the way to learn from accidents.

Technical Editor, David Pockett, explained that navigation aids are only "as good as the user" and need an alert observer who understands the input and output, can assess the data provided, and identify faults. "In the future," he said, "the navigator will still play an important role but the job specification will be wider and more sophisticated than before. Spatial issues too will become ever more of a challenge".

Mr Pockett is a leading casualty investigator and a member of the panel of Special Casualty Representatives at Lloyd's. "The continued exploration for hydrocarbons offshore and implementation of renewable energy systems will have an impact on navigation, particularly in coastal areas," he explained. New exclusive economic zones, reduced sea room, greater regulatory measures and the need for yet tighter control, all suggest a leaning towards a 'Big Brother' approach in the future.

He said that with the prospect of autonomous ships and increased involvement of VTS it might be a case of "the navigator navigating or being navigated, or perhaps moving from active to passive navigation."

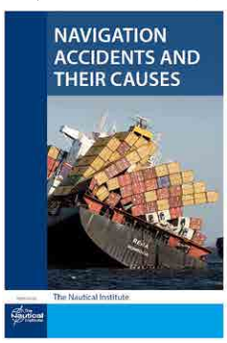
The book launch coincided with a seminar organised by the Institute on Manning and Fatigue. Captain Nick Nash, an Institute Vice-President, said "We have been informing the world about the dangers of fatigue and lobbying for change for decades. The danger of operating a Master/mate six-on/six-off system is that the ship cannot comply with the ISM Code and its own SMS or, at best, has great difficulty in complying. Extreme fatigue in all watchkeepers is bound to result.

"We will continue our campaign as fatigue is a factor in many accidents and near misses, minor and major. We hope that is the start of a new phase in our work towards reducing, if not removing, the threat that crews face from fatigue."

Captain Nash, who serves with Carnival Cruises, added "The overall message from the book and the seminar is that everyone can learn from the mistakes of others and everyone has a part to play in ensuring that training and experience are used effectively to keep vessels safe. Onboard training and mentoring may hold the key, and the navigation bridge is an ideal place for this to take place."

Navigation Accidents and their Causes is available from The Nautical Institute's website www.nautinst.org/pubs for GB£45.

The Nautical Institute, *Press Release,* 21 September 2015



Launch of Inaugural Defence Maritime Science and Technology Strategy

The inaugural Defence Maritime Science and Technology Strategy, which outlines areas where the Defence Science and Technology Group can support Australian Defence Force maritime capabilities over the next decade, was launched on 22 March this year in Canberra.

During the signing ceremony, Head of Navy Capability, RADM Jonathan Mead, said that the strategy, co-developed by Navy, Air Force, CASG and DST, was "symbolic of the One Defence approach, where we are moving to a partnership between the services and groups."

"We are all in this together," RADM Mead said.

The strategy document was co-signed by David Kershaw in his role as Acting Domain Program Manager — Maritime, and witnessed by CPO Jim Smith who is leading the DST D2 Strategic Initiative (Client Engagement with a Strategic Focus).

Jim pointed out that this is the first of what will be a suite of domain S&T strategies. "These strategies are an important way of ensuring the S&T program is meeting the long-term needs of the services and groups."

Entitled *Shaping Defence Science and Technology in the Maritime Domain: 2016–26*, the new strategy outlines future areas of focus for Defence capability and objectives, and identifies which areas of science and technology have the potential to support their development.

The five primary focus areas are:

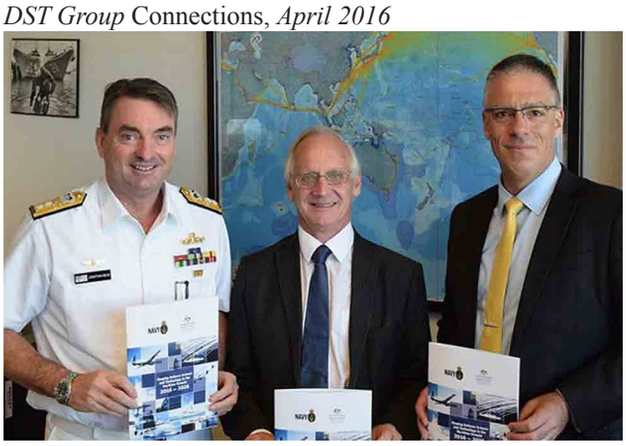
- decision superiority;
- mission survivability in a high-threat environment;
- joint and combined operations;
- creating and shaping the future force; and
- seaworthy and airworthy fleet.

Apart from the focus areas, the strategy identifies the following priority areas as intended to inform and shape science and technology capabilities:

- information integration and interoperability;
- robust and protected networks and infrastructure;
- task group operations;
- theatre anti-submarine warfare;
- integrated air and missile defence, and
- enhanced current capability.

A copy of the strategy can be downloaded from the DST Group web site.

DST Group Connections, *April 2016*



Head of Navy Capability RADM Jonathan Mead, CPO Jim Smith, David Kershaw (Chief of Maritime Division DST Group) with the Strategy document
(Photo courtesy DST Group)

The Austal USA-built USS *Coronado* (LCS 4) launches the first over-the-horizon missile engagement using a Harpoon Block 1C missile as part of RIMPAC 2016
(US Navy photograph)

EDUCATION NEWS

Curtin University

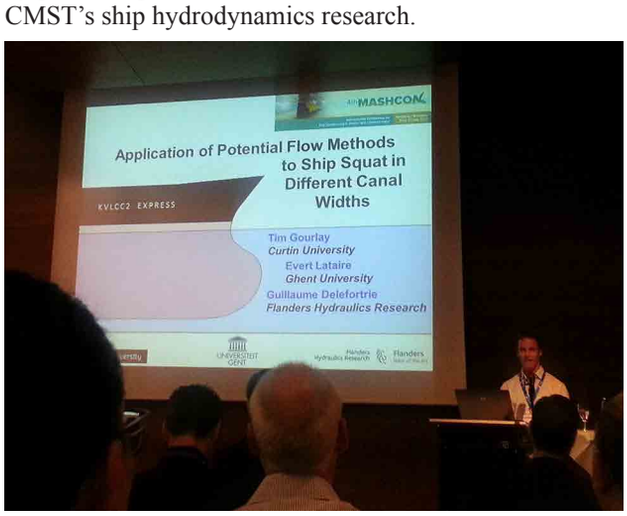
Fremantle Containership Trials

In April the Centre for Marine Science and Technology (CMST) conducted a set of 15 containership trials in Fremantle to measure ship motions and under-keel clearance (UKC). Three GNSS receivers were used on each ship, together with a shore base station, to yield centimetre-accuracy ship motions. Wave and tide data were recorded concurrently. The trials were a joint research project between CMST, Fremantle Ports and OMC International to validate ship UKC prediction methods. Scott Ha is currently analysing the data as part of his PhD thesis.

Tim Gourlay and Scott Ha on a containership departing Fremantle with GNSS receiver on left
(Photo courtesy Tim Gourlay)

MASHCON Conference

In May, Tim Gourlay and Scott Ha travelled to Hamburg to present papers at the Fourth International Conference on Ship Manoeuvring in Shallow and Confined Water (MASHCON 2016). The papers presented were *Measured Ship Motions in Port of Geraldton Approach Channel* and *Application of Potential Flow Methods to Ship Squat in Different Canal Widths*. Tim was on the technical committee for the conference, and followed the conference by presenting a seminar at MARIN in The Netherlands on CMST's ship hydrodynamics research.



Tim Gourlay presenting at MASHCON 2016
(Photo courtesy Scott Ha)

Navigation Accidents and their Causes

Tim Gourlay has written a chapter on ship under-keel clearance for the new book *Navigation Accidents and their Causes* published by The Nautical Institute.

For a review of the book, see the *From the Crow's Nest* column.

Navigation Accidents and their Causes is available from The Nautical Institute's website www.nautinst.org/pubs for GB£45.

Tim Gourlay

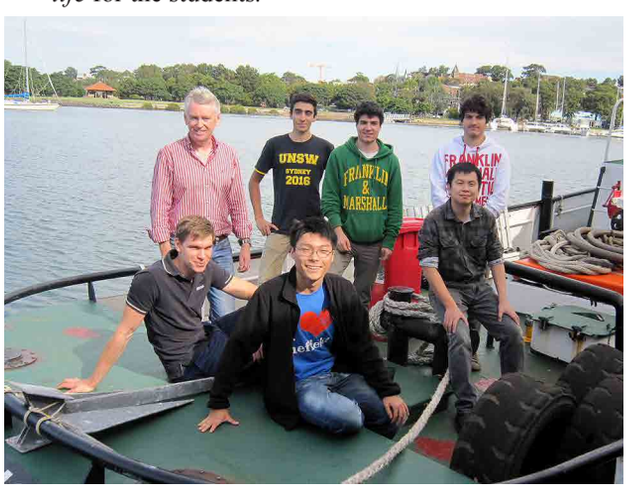
University of New South Wales

Undergraduate News

NAVL3610 Industry Visits

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

- On 11 May we visited Sydney Heritage Fleet at Rozelle Bay for the students to conduct and inclining experiment on the 50 ft (15.24 m) tug *Currawong*. The day was perfect for an inclining; fine and sunny, with a 0–3 kn breeze and flat-calm conditions. The students, with guidance from the lecturers, made a good fist of their first inclining. The theory of stability is fascinating, but seeing it in practice at an inclining makes it come *to life* for the students.



UNSW inclining crew
Back: David Lyons, Adrien Parpinel, Stefano Ferrighi, Gian Maria Ferrighi
Front: Angus Bratter, Yun Wang, Yun Hang Cho
(Photo Phil Helmore)

- On 18 May we visited Svitzer Australasia at Port Botany where Captain Ted van Bronswyk and Marine and Technical Manager Geoffrey Fawcett showed us over the Damen-built tug *Svitzer Warang*. We saw the accommodation and then the engine room, noting in particular the Caterpillar main engines, the mufflers, the box coolers, the fire pump, the gensets, the shafting, the control station (the modern version of the MCR) and the bulkhead cable glands. In the propulsion compartment we saw the azimuthing stern-drive units and the spare gear. Up on the foredeck we checked out the towing winch, the towing eye, bulwark structure and the

anchoring arrangements. Of particular interest was the towhook on the starboard side of the vessel, with the towrope guided through a towing eye on the centreline.

Then Geoffrey Fawcett and Year 4 student and Svitzer employee Angus Bratter and gave us a tour of Chinese-built *Svitzer Swift*, pointing out differences in layout and quality of construction.

Finally, Angus Bratter and Chief Engineer Nazmul Hossain (also a graduate of UNSW Australia) led us on a tour of Damen-built *Endeavour*, a shorter tug but with higher bollard pull, noting the more-cramped accommodation and layout.

The inspection enabled the students to see some of the principles of tug design. Importantly, they were able to see variations in the layout of the vessels, the visibility from the wheelhouses, the propulsion trains, arrangements for towing over the bow with the towing winches, and long tows over the stern. The students were impressed with the concept of towing over the bow, the fire-fighting arrangements and the azimuthing stern-drive units. They learned a lot about the towing operation, and a whole range of ship terminology.

- On 25 May we visited Lloyd's Register, where Paul O'Connor and Joanna Mycroft gave the students an introduction to ship classification with a short history of LR, an overview of classification society operations in general, and then the details of ship classification; how, where and why it is done. The students were introduced to design appraisal, construction surveys; special, docking and continuous surveys, to the relationship between the IMO, flag states and classification societies, and to Rules for Special Service Craft. They were all impressed with the overall coverage of classification, and the highlighting of various aspects by talking about particular vessels and problems encountered (and photos of them) brought it all to life. The videos of the Clarke and Dawe commentary on the bow of *Kirki* falling off and the theory of the sinking of *Derbyshire* were particularly impressive.

Thesis Topics

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

Performance Analysis of a Yacht

The performance of ocean racing yachts does not always match the predicted performance.

James Johnston is investigating the performance of an instrumented yacht and is comparing the results with the performance predicted by a velocity-prediction program (VPP) on a number of points of sailing and wind strengths. Reasons for variations will be investigated with a view to adjustment of the prediction variables.

Combustion of Diesel Fuel in High-temperature, High-pressure Conditions

The link between fuel temperature and pressure in the injector of a diesel engine and soot production post-combustion is not well understood.

Adela Greenbaum has conducted an investigation of the link by varying temperature and pressure of the fuel in the injector, and measuring the soot production post-combustion using multi-line laser-induced extinction.

Graduation

At the graduation ceremony on 14 June, the following graduated with degrees in naval architecture:

Alvin Lim	BE	H1
Molly McManus	BE	H1
Alistair Smith	BE	H1
	and University Medal	
Dov Sobel	BE	H1
Mitchell Stubbs	BE(Hons)	H1
Elisa Taniputra	BE	H2/2
Alexander Walter	BE	H1
Bryce Waters	BE	H1

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

Mitchell Stubbs deserves special mention as, not only the first naval architecture student to graduate from UNSW Australia with the new Bachelor of Engineering (Honours) degree, but the first in all five degree streams in the School to do so. With the new BE(Hons) degree, the weighted average mark for the award of Honours Class 1 has been raised from 75 to 80, and so is more difficult to achieve. Congratulations Mitchell!

Alistair Smith's University Medal also deserves special mention. This is the highest honour awarded at undergraduate level, and requires a weighted average mark of at least 85. Of the 370 degrees awarded in naval architecture at UNSW, just 13 have been awarded the University Medal. Congratulations, Alistair!

Alex Walter, Mitchell Stubbs, Andrew Baglin (PhD), Phil Helmore
Elisa Taniputra, Molly McManus and Alistair Smith
at the UNSW graduation ceremony on 14 June
(Photo courtesy Teresya Taniputra)

Prize-giving Ceremony

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

The Royal Institution of Naval Architects (New South Wales Section) Prize 1 for the best performance by a student in Year 1 of the naval architecture degree program to Isabella Yan (awarded in absentia).

The Royal Institution of Naval Architects (New South Wales Section) Prize 2 for the best performance by a student in Year 2 of the naval architecture degree program to Gian Maria Ferrighi, presented by the Chair of RINA (NSW Section), Alan Taylor.

The Royal Institution of Naval Architects (New South Wales Section) Prize 3 for the best performance by a student in Year 3 of the naval architecture degree program to Geoffrey McCarey, presented by the Chair of RINA (NSW Section), Alan Taylor.

The Royal Institution of Naval Architects (Australian Division) Prize for the best ship design project was shared equally by Alex Walter for his design of a 12 m composite cruising/racing yacht for a Ballina, NSW, owner and Alistair Smith for his design of a 30 m high-speed catamaran ferry for sightseeing tours operating out of Townsville, Qld, presented by the President of RINA (Australian Division), Martin Renilson.

The David Carment Memorial Prize and Medal for the best overall performance by a student in the final year was also shared equally by Alistair Smith and Alex Walter, both with Honours Class 1. The prize was presented by Naval Architecture Stream Senior Lecturer, Phil Helmore.

Alistair Smith's father, Warren Smith, also graduated from UNSW in naval architecture in 1982 with Honours Class 1, becoming the first father-and-son team to do so. In a nice touch, Warren also received David Carment Memorial Prize and Medal for the best overall performance by a student in *his* final year!

Congratulations to all on their fine performances.

Acting Head of School, Con Doolan (L) and Alan Taylor with Isabella Yan's RINA (NSW Section) Year 1 prize
(Photo courtesy Diane Augee)

Alan Taylor (R) presenting the RINA (NSW Section) Year 2 prize to Gian Maria Ferrighi
(Photo courtesy Diane Augee)

Alan Taylor (L) presenting the RINA (NSW Section) Year 3 prize to Geoffrey McCarey
(Photo courtesy Diane Augee)

Martin Renilson (L) presenting the RINA (Australian Division) prize to Alexander Walter
(Photo courtesy Diane Augee)

Martin Renilson (L) presenting the RINA (Australian Division) prize to Alistair Smith
(Photo courtesy Diane Augee)

Phil Helmore (L) presenting the David Carment prize to Alexander Walter
(Photo courtesy Diane Augee)

Phil Helmore (L) presenting the David Carment prize to Alistair Smith
(Photo courtesy Diane Augee)

Alistair and Warren Smith with their David Carment medals
(Photo courtesy Warren Smith)

Graduates Employed

Our 2016 graduates are now employed as follows:

Alvin Lim	Jurong Integrated Structure (a Division of Sembcorp Marine), Singapore
Molly McManus	One2three Naval Architects, Sydney
Alistair Smith	Maritime Acquisitions Branch, Capability Acquisition and Sustainment Group, Canberra
Dov Sobel	Evaluating opportunities
Mitchell Stubbs	LEAP Australia, Sydney
Elisa Taniputra	Incat Crowther, Sydney
Alexander Walter	Royal Australian Navy, Sydney
Bryce Waters	One2three Naval Architects, Sydney

Post-graduate and Other News

Andrew Baglin PhD

At the graduation ceremony on 14 June, Andrew Baglin graduated with his Doctor of Philosophy (PhD) degree for his dissertation on *Investigation of Drag Reduction Using Superhydrophobic Surfaces.*

Superhydrophobic surfaces have been shown to reduce drag in laminar flows; however, in turbulent flows, the literature is divided with drag reductions between 0% and 70% being achieved. With frictional drag accounting for over half of the resistance of most ships, a method of decreasing drag would result in both significant fuel savings, and a reduction in carbon dioxide emissions. In order to ascertain whether these surfaces can provide a reduction in drag in turbulent flows, experimental and detailed computational fluid dynamics studies have been undertaken. In addition to determining whether turbulent-flow drag reduction is achievable, this work investigated both the mechanics and conditions under which the drag reduction occurs, and quantified the interaction between the hydrophobic surface and the turbulent multiphase flow.

The experimental program aimed to determine whether drag reductions in high Reynolds number flows were achievable. As part of the research, a test rig was designed and constructed which allowed measurement of skin friction drag whilst minimising the effects of pressure drag. A hydrophobic surface was compared to a smooth plate across a range of turbulent-flow Reynolds numbers with no noticeable drag reductions shown. Further investigations into the reasons for the lack of drag reduction were then undertaken using computational fluid dynamics.

The lattice Boltzmann method was used to accurately simulate the interactions between air and water at a scale where surface tension dominates. A code featuring methods which included fractional propagation, a novel technique of mesh refinement, a multiphase model and pseudo direct numerical simulation of turbulence was devised and implemented. Validation across a range of benchmark tests was performed and the code proven to produce accurate results. An optimisation process was also undertaken to maximise efficiency.

This code was then used to simulate laminar, transitional and turbulent flows through a smooth-walled channel, and over a series of roughened and hydrophobic surfaces.

The results of this research have confirmed that drag reductions in laminar and transitional flows are achievable; however, at Reynolds numbers greater than Re = 390, minimal benefit was found because the air layer against the surface was removed. The drag reduction effect has been shown to be dependent on the location of the free-surface, and the way in which it insulates the ridges and posts on the hydrophobic surface from the water. The geometry of the surface has also been shown to have an effect on both the overall drag and the ability of the surface to maintain the insulating air layer.

Andrew is now employed by Stewart Friezer Marine in Brisbane.

EA Accreditation

Engineers Australia accredits engineering degrees around Australia every five years. Having been last re-accredited in 2011, engineering degrees at UNSW Australia were all up for re-accreditation this year.

The School's submission on our five degree programs, aerospace engineering, mechanical engineering, mechanical and manufacturing engineering, mechatronic engineering and naval architecture, was mainly put together by Director of Undergraduate Teaching, Garth Pearce, Nathan Kinkaid and Catherine Pogonowski. The submission included details of the program structure revision undertaking following the last re-accreditation, and the refurbishment of the laboratory and tutorial buildings.

The visiting team from Engineers Australia comprised

- Prof. Adrian Mouritz, RMIT University;
- Prof. Friso de Boer, Charles Darwin University;
- Mr Neville Probert, Royal Aeronautical Society, recently retired from CASA;
- Mr Ken Hannah, BAE Systems; and
- Mr Charles Tan, Observer from Myanmar;

and they visited UNSW on 25–27 May.

Verbal feedback was generally positive, and we wait for the detailed assessment in the final report.

New HoS

Prof. Chun Wang has been appointed as the next Head of the School Mechanical and Manufacturing Engineering at UNSW Australia.

Prof. Wang received his PhD from the engineering faculty at Sheffield University. From 1995 to 2009 he was Head of Advanced Composites Technologies of the Defence Science and Technology Organisation, where his achievements included project lead for a $6.5 million award from the US government to develop composite repair technology for the Joint Strike Fighter aircraft. From 2002–3 he held a Defence Science Fellowship at Stanford University. In 2009 he joined the academic staff of RMIT as Director of the Sir Lawrence Wackett Aerospace Research Centre. Over the past five years he has been awarded 12 ARC grants (six as lead CI) and attracted nearly $10 million in research funding, including a number of industry research contracts. He was a Member of the College of Experts on the ARC from 2013–15. He has taught in the areas of mechanics, fracture and composites.

Prof. Wang joined UNSW Australia on 1 August and commence in the role of Head of School in January 2017. A/Prof. Con Doolan will continue as Acting Head of School until the end of this year.

Phil Helmore

UNSW Dominates Engineering Ranking

UNSW Australia is the standout Australian university in engineering research, being ranked the best local institution in five out of seven categories in a new international ranking by the Shanghai Research Consultancy.

UNSW was highest placed in energy science where it was placed 16th in the world, as well as topping the local list for civil (41), electrical (64), materials (61) and mechanical engineering (67). The University of Queensland topped the local list for chemical engineering at 27 internationally, while James Cook University topped the environmental engineering list at 48.

Indeed, Australia had eight universities in the top 100 world-wide in environmental science and engineering, as well as eight in civil engineering. Four universities were placed in the top 100 in both energy science and materials engineering.

Rankings expert, Tony Sheil from Griffith University, said that the new ranking clearly demonstrated that engineering was becoming a "fastmoving and hotly-contested discipline where younger institutions can successfully leverage off their established disciplines, such as electrical and chemical sciences, to quickly gain a foothold into fields such as environmental engineering, materials engineering and energy science".

"Although UNSW is the star performer leading Australia in five of the seven fields, the real revelation is that the top 50 honours are shared quite evenly among the Group of Eight (UNSW, UQ and Monash) and nonGroup of Eight (JCU, Newcastle and Curtin). The split across all seven fields shows an even balance between Go8 and nonGo8," Mr Sheil said.

"The other pleasing surprise is that Wollongong and Curtin are present in six of the seven fields while the only Australian universities with a presence in all seven fields are UNSW, Adelaide and UWA, which might raise eyebrows — not so much the fact that these are present but because of which institutions are missing from at least one field."

The US had the top-ranking institution in six of the seven fields, with MIT topping two. China's Tsinghua University topped the list in energy science and engineering.

The Australian. 15 June 2016

Australian Maritime College

AMC to Strengthen Engagement with Defence

The Australian Maritime College at the University of Tasmania is poised to help the Australian Defence Force meet its future maritime training, education and research needs following the appointment of Aaron Ingram to the newly-created role of Defence Maritime Program Manager.

Mr Ingram will be responsible for developing a closer and more productive relationship with Defence, particularly the Navy, as they embark on a major capability transformation as part of the Australian Government's recently released Defence White Paper.

"My focus initially will be on engaging with key leaders

and managers across Defence to gain a deeper appreciation of their higher education, training and research needs, and to increase awareness of AMC's potential to deliver against these needs," Mr Ingram said.

"The other major goal in this next 12 months will be to reinvigorate the existing training working group between AMC and Navy as the means of facilitating ongoing collaboration."

Australian Maritime College Defence Maritime Program Manager Aaron Ingram
(Photo courtesy AMC)

AMC Principal, Prof. Neil Bose, said that the strategic appointment would help build upon the institute's long-standing and successful association with Defence.

"The AMC has assisted in elements of the training and education of Navy personnel throughout its history, and there is great scope for us to play an increased and key role in upskilling the workforce to meet the demands of the national maritime defence procurement and sustainment program," Prof. Bose said.

"As Australia's national institute for maritime training, education and research, we are uniquely positioned to offer tailored and flexible solutions to help the department deal with this increased demand and prepare for the delivery of new capabilities and technologies."

Mr Ingram has enjoyed a rewarding 37-year career in the Royal Australian Navy, during which he attained the rank of Commodore and gained extensive domestic and international sea-going service on board a range of warships and auxiliary vessels. He will be based in Sydney for this role.

Mr Ingram's personal association with AMC started in 1998 when, as an aspiring navigator, he completed deep-draught and tug-handling training on the ship simulator. Almost 30 years on, he is impressed with the expansion of the college's training and research facilities and the "can do" attitude of staff.

"This role provides me with a wonderful opportunity to be able to continue my contribution to the Navy and our nation's security, which has been the focus of my entire working life. There is nothing more important for our servicemen and servicewomen than to be well equipped and highly trained," he said.

Simulator Assessment

Working at sea can be tough. Operating in confined spaces, extreme weather and being far away from help in an emergency can all contribute to a (very) challenging environment.

Preparation, in particular for emergency situations, is therefore vital for new seafarers who need to be thoroughly trained for life on board before starting work.

Dedicated training vessels — operational ships which are solely used for training purposes — are ideal but, with operational costs as high as $10 000 a day, they can be prohibitively expensive.

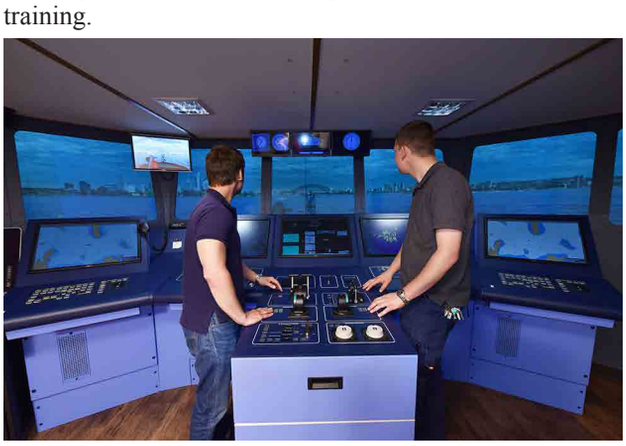
For individuals, cadet placements on operational vessels are one alternative. But a lack of space on board merchant ships means that they are increasingly hard to come by — and almost impossible in countries, such as landlocked ones, which don't have many ships to begin with.

A well-documented lack of seafarers coming up through the ranks also exacerbates the issue, with those that do qualify often advancing rapidly and often being less experienced in ship handling and manoeuvring than earlier generations.

For these reasons, many organisations see simulation facilities as part of the solution and are investing in them heavily; the RAN opened a state-of-the-art simulation facility in Sydney earlier this year and AMC itself has recently carried out a $1.4 million upgrade on its real-time maritime simulation technology, including a full-mission ship's bridge, a tug simulator and six ship-operations bridges.

How effective are simulators in preparing seafarers for emergency situations?

Researchers at AMC are attempting to find out and have carried out a pilot study comparing the effectiveness of training on vessels with computer-based and simulated training.



Inside the ship simulator at the AMC
(Photo courtesy AMC)

The work is led by Prof. Margareta Lutzhoft, who researches 'human factors' — or how ships and systems should be designed around humans' capabilities, skills and needs, rather than vice versa.

"This is an area which is just beginning to be researched and

it's so important because maritime systems and processes often fail to consider how people behave, which can lead to inefficiencies and even accidents.

"Simulated training is becoming increasingly relied upon and it is the right time for us to measure its effectiveness compared to on-vessel training."

Together with her team — Paul Brown, Clarence Pietersz and Siri Hirimbure — Prof. Lutzhoft gathered nine first-year undergraduate students with no formal seafaring experience.

The students were briefed together on a man-overboard scenario and then split into three groups to undertake training on how to respond.

One group carried out the training on board one of AMC's dedicated training vessels, *Reviresco*; another was trained in a full-mission simulator at AMC; and the third undertook their preparation in a computer-based training lab.

Three hours later, the students re-grouped on the ship and were individually assessed using standard assessment criteria on their performance in areas including practical tasks, team work and preparation.

The results showed that, in certain practical tasks such as manoeuvring and positioning, the simulator trained students performed just as well as those on the vessel.

"This suggests that practical tasks can indeed be trained in full-mission simulators without affecting the quality of the results," said Prof. Lutzhoft.

The simulator-trained students obtained slightly lower scores in the area of teamwork, whilst the group trained in the computer lab did less well in all areas.

"Other tasks, such as teamwork, may still need to be trained on board, or we need to better prepare simulator scenarios to ensure that we address all aspects of a situation and the appropriate response."

With the pilot completed, Prof. Lutzhoft and the team are undertaking further research to detail exactly which tasks can and should be trained ashore.

They are also looking more deeply into which training and assessment methods are the most effective, a task carried out in close cooperation with the Australian Maritime Safety Authority.

Prof. Lutzhoft is confident that their work will help further our understanding of how best to prepare seafarers for life at sea.

"By understanding how and why people are best trained for work on board ships, we can provide training that meets their needs, and the needs of the industry, in an effective way."

New Underwater Robot to Explore Antarctica's Icy Depths

A new underwater robot which will help scientists answer important questions about the Antarctic is due to arrive in Tasmania in early 2017, thanks to a contract awarded to International Submarine Engineering (ISE).

Capable of diving to depths of 5000 m and travelling over 100 km under metres of thick ice, the Explorer-class autonomous underwater vehicle (AUV) will

An Explorer-class AUV
(Photo courtesy AMC)

be programmed to collect data on research missions. In an innovative development, it will also be customised to collect physical samples from below ice shelves, helping scientists to explore new parts of the Antarctic environment — and understand its impact on the global climate — in unique ways.

The AUV is funded by the Antarctic Gateway Partnership — a $24 million Special Research Initiative of the Australian Research Council which aims provide new insights into the role of Antarctica and the Southern Ocean in the global climate system — and by the Australian Maritime College.

AMC Principal, Prof. Neil Bose, said that the contract meant that Tasmania was a step closer to realising its ambitions as a global centre of excellence for underwater robotics.

"We are very pleased to have awarded the contract for our flagship new AUV to International Submarine Engineering. Their Explorer AUV is the most capable in the world for use under sea ice and will allow us to capitalise on the robotic age of Antarctic exploration.

"The Explorer will join a fleet of similar underwater robots in a $750 000, state-of-the-art facility, due to open at AMC in late 2016. This world-class AUV hub will put AMC and Tasmania at the cutting-edge of research in this field, and enable us to undertake a range of academic, defence and industry-partnered projects."

The ISE Group of Companies is a world-leader in the design and integration of autonomous and remotely-operated robotic vehicles and terrestrial robotics.

AUV co-ordinator, Peter King, said that ISE's Explorer was a clear choice for the Antarctic Gateway Partnership's next-generation polar vehicle.

"The Explorer is engineered for deployment in challenging, under-ice conditions. At seven metres long and weighing around two tonnes, its duration is exceptional and can travel over 140 km — or for 24 hours — without needing to be re-charged.

"It's also highly customisable, and the engineering team will fit it with a full suite of instruments, including a tool for collecting samples from below thick ice shelves."

AUV researcher, Dr Damien Guihen, explained how the unique features of the Explorer will help further scientists' understanding of the Antarctic environment.

"The new AUV will allow us to answer important questions about the past, present and future of the Antarctic continent and fringing ice shelves, as well as their role in the global climate system.

"The ability to bring back physical samples from beneath ice shelves is something which has not been possible before and is necessary to cast light on the complex interactions of the ice, land and sea."

The Explorer will undergo sea trials in early 2017 and is expected to arrive at AMC in the autumn.

Wave Simulation Research to help FLNG Platforms Operate in Challenging Conditions

Floating liquefied natural gas (FLNG) platforms such as *Prelude* will operate in remote and often rough waters, where they will undertake the high-risk work of extracting and storing natural gas before offloading it safely onto tankers.

As the largest offshore facilities ever constructed, the behaviour of such gigantic vessels has not been observed in a real-world environment before. To help understand the conditions that they will face, a researcher at the Australian Maritime College is working to simulate the exact environment and develop recommendations to help them operate without interruption.

Yuting Jin is investigating how wind and resonance waves — those which form when the much smaller tankers moor up alongside the platform for the gas to be unloaded — will cause the platform to pitch and roll, potentially threatening safe operations.

Yuting is using numerical modelling and comparing the results to experimental simulation carried out using a 1:100 scale model deployed in AMC's model test basin. He generates both real and virtual waves at different frequencies and observes how the platform responds to them.

He is able to make extremely accurate predictions using an increasingly-popular method called unsteady RANS, which relies on significant computing power to include in the calculations the effect of viscosity — comparable to the 'thickness' — of the water. Being able to factor in viscosity is critical for accurate prediction as it causes friction on the hulls of the vessels which can affect how the waves form.

Yuting has so far simulated the interaction between a FLNG platform and the tankers and analysed how the motion of the platform is affected by both bow-on and oblique currents.

FLNG model under test in the towing tank at AMC
(Photo courtesy AMC)

His research will continue until 2017, and in this time he will undertake further simulations on the interactions between the platform and the tankers in different wave scenarios. Yuting's end goal is to contribute to safe operations of the FLNG platforms of the future by creating a specific set of recommendations for operations and crew training, as well as investigating whether regulations are required.

From a Childhood Obsession to a Career in Naval Architecture

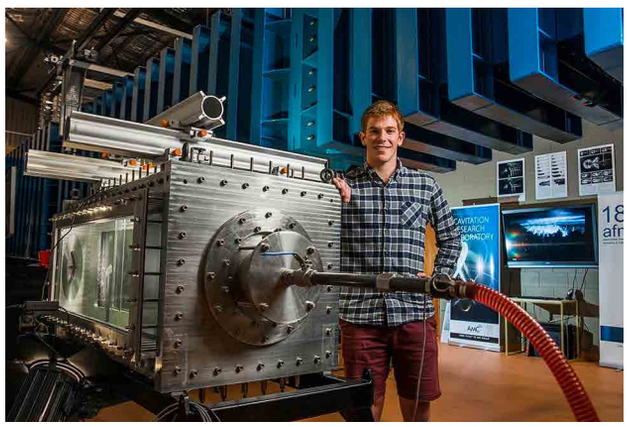
Meet Matthew Trump — the first graduate of the innovative joint Bachelor of Engineering programme from the Australian Maritime College (AMC) in Tasmania and Edith Cowan University (ECU) in Western Australia.

Growing up in the outback town of Kalgoorlie in Western Australia, Matthew's formative years were spent a world away from the ocean, ships or any hint of the maritime world.

During holidays spent at his grandparents' house on the coast, he enjoyed venturing out on his dad's small fishing boat. "I just loved the feeling of being on the water."

Then, during high school, he moved to the coastal city of Fremantle where he was excited to see "properly big" Australian and international ships coming and going, and where his hobby of drawing boats in his spare time "turned into an obsession".

Fast forward a decade and perhaps it's no surprise that Matthew has progressed from sketching ships to designing them in his job as a naval architect in Western Australia. He is also the first graduate of the joint Bachelor of Engineering programme from AMC and ECU, a cross-institutional degree which sees students spend two years studying Engineering at ECU followed by two years specialising in Ocean Engineering, Naval Architecture or Marine and Offshore Systems at AMC. Matthew was initially unsure about the prospect of splitting his studies across two institutions. "I worried that I could be lacking vital knowledge when I made the move to Tasmania in the third year." However, he was soon convinced that the collaborative degree was ideal for the career he wanted to pursue. AMC's hydrodynamic facilities appealed, as did the ability to study maritime engineering without spending the full four years away from home (there are no universities in Western Australia offering specialist maritime engineering courses). What really sold it to him was the opportunity to gain hands-on experience for the duration of the degree. "One of the main



Matthew Trump in the AMC Cavitation Research Laboratory
(Photo courtesy AMC)

attractions of the engineering courses at AMC was the practical project experience on offer, including an ocean vehicle design project and 12 weeks of work experience. To me, the coupling of theory and practical coursework really helped distinguish AMC from other institutions." Matthew's first two years studying pure engineering at ECU gave him a "solid engineering foundation" and the transition to Tasmania in the third year was smooth.

"Everyone at the college is very friendly and shares a passion for the ocean. This creates a very welcoming atmosphere, especially for transfer students traveling interstate. "All of the staff at AMC are very knowledgeable, approachable and incorporate a perfect balance of theoretical knowledge and practical real-world examples." When it came to practical work, Matthew valued being able to watch live demonstrations and conduct coursework in specialist facilities such as the Model Test Basin, the Towing Tank and the Cavitation Research Laboratory. He also found it very useful to study the theories underpinning marine computational software and understand them enough to be able to troubleshoot problems, should they arise.

Matthew describes the highlight of his time at AMC as the opportunity to voyage on *Bluefin*, AMC's 35 m flagship training vessel. He took two trips on *Bluefin* and found the experience to be one that could never be replicated in the classroom. "It is invaluable to be able to step aboard a working vessel such as *Bluefin* and to witness first-hand how the design of a vessel affects its operations. It is the perfect place to ask lots of questions, soak up knowledge from the crew and lecturers, and strengthen friendships with classmates." Not all aspects of the course were easy to master — Matthew found teamwork a real challenge and expects that his experience working in large and small groups has prepared him well for the world of work. "The ability for an engineer to work in a group is vital, and oftentimes it is a combination of individual solutions which results in the most effective solution. One of the biggest challenges I faced was learning to incorporate a multitude of different solutions and ideas into my own to achieve the best possible outcome. Working in groups at AMC highlighted this, and the more group work I participated in, the clearer it became." Having graduated in late 2015, Matthew worked for himself for a short period before accepting a graduate job with Southerly Designs, a naval architecture and marine design consultancy in Port Denison, Western Australia

With this small, experienced team, Matthew is laying the foundations for a bright career. With colleagues who are extremely willing to share their expertise, Matthew sees his position as having fantastic potential for career advancement. His dream is one day to work as a superyacht designer but, for now, he's extremely happy where he is. "My plans are to gain as much experience as I can with the team at Southerly Designs." He is effusive in his recommendation of AMC to anyone looking for a career in naval architecture, ocean engineering or marine and offshore engineering, "Studying at AMC has been one of the greatest experiences and most rewarding adventures of my life".

Matthew Trump was awarded the Royal Institution of Naval Architects (Australian Division) Prize for 2016 for the best research project by a final year student in the Bachelor of Engineering (Naval Architecture) course at the Australian Maritime College.

THE INTERNET

Webcasts of NSW Section Technical Presentations

In 2011, Engineers Australia began recording selected technical presentations made to RINA (NSW Section) and IMarEST (Sydney Branch) for webcasting using Mediavisionz. The recordings were placed on the Engineers Australia website. 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.

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

However, in early 2015, Engineers Australia discontinued the new recording method and the EoL website for regular monthly presentations, and resumed using Mediavisionz while considering options for future recordings.

In 2015, only one recording of our presentations was made, of Warren "Skip" Miller's presentation on *Side Lifting Foils and Support Structure on* Wild Oats XI on 1 April, and the presentation is shown, with a hotlink, on the NSWwebcasts website.

In 2016, Engineers Australia discontinued recording presentations in the Harricks Auditorum. Recordings may still be made, but must be arranged and paid for by the society using the Auditorium. We are currently investigating options.

For future recordings, watch this space!

Phil Helmore

Professional Employees Award

The Fair Work Commission's *Professional Employees Award 2010* applies to engineers and, hence to naval architects, and so is worthy of note. It covers items such as levels of engineering expertise, types of employment, minimum wages, hours of work, leave and public holidays, etc. and is available at

www.fwc.gov.au/documents/documents/modern_awards/pdf/ma000065.pdf.

Phil Helmore

Engineers and Naval Architects Practising in Queensland

Queensland is currently the only Australian jurisdiction to apply a comprehensive registration system for engineers.

Registration as a Registered Professional Engineer of Queensland (RPEQ) is formal recognition of the qualification, experience and competency of an engineer. Engineers occupy positions of trust and responsibility within the community, industry and across government, and perform a critical role in the design and construction of major infrastructure and in the mining, resources and manufacturing sectors.

There are currently 26 areas of engineering recognised by the Board of Professional Engineers of Queensland (BPEQ). BPEQ works with professional organisations to define these areas of engineering, which range from aeronautical to civil engineers, chemical engineers to naval architects. The registration system ensures that a high standard of practice exists within Queensland across all areas of engineering.

It is a requirement of the Professional Engineers (PE) Act that professional engineering services in Queensland or for Queensland, are carried out by a RPEQ or, alternatively, by a person who carries out the services under the direct supervision of a RPEQ who is ultimately responsible.

The PE Act applies extraterritorially, meaning that registration is still required for any professional engineering services carried out interstate or overseas but destined for Queensland. This could include the design, construction and maintenance of a building, plant or machinery. If a RPEQ is not carrying out the engineering service themselves, then a RPEQ in Queensland must be in a position to take responsibility for the professional engineering services provided.

BPEQ *Website/Registration*

BPEQ Launches Bursary for Women in Engineering

A bursary to assist women in engineering back into the workforce has been launched by the Board of Professional Engineers of Queensland (BPEQ).

The Back-in-the-Workforce bursary is open to female registered professional engineers, non-practising professional engineers or former registered professional engineers based in Queensland. The bursary will assist successful applicants to attend continuing professional development courses and maintain or regain their registered status.

Bursary applicants can claim up to $500 to cover the costs of continuing professional development. Applicants can download and complete the application form on the BPEQ website

BPEQ *Media Release*, 1 August 2016

STS *Tenacious* at the Australian National Maritime Museum during her first visit to Sydney. *Tenacious* is a British wooden sail-training ship completed in February 2000, specially designed to accommodate anyone over 16 with a disability
(Photo John Jeremy)

DCNS and Quickstep sign MOU

French shipbuilder DCNS has signed a Memorandum of Understanding (MOU) with the Australian manufacturer of advanced composite technologies, Quickstep, as a first step for cooperation in the field of components and assemblies for Australia's future submarines.

The MoU was signed in Canberra by Marie-Pierre de Bailliencourt, Deputy Chief Executive Officer, DCNS Group, and David Marino, Chief Executive Officer and Managing Director of Quickstep Holdings Limited.

Through this MoU, Quickstep will produce representative demonstrator components to validate their technology for naval applications with DCNS.

"DCNS has commenced building a supply chain in Australia which will support the submarine capability on a sustainable basis," said Sean Costello, CEO of DCNS Australia.

"Ultimately this supply chain will comprise several hundred companies across Australia and form the Future Submarine Enterprise."

DCNS has been selected as the Australian government's preferred international partner for the design of 12 future submarines for the Royal Australian Navy.

IMC Pilot Boat Acquisition Management

International Maritime Consultants' most recent acquisition-management project has reached a successful conclusion with the handover of *AMG Winyama*, the latest pilot boat in the Argonaut Marine Group fleet.

Argonaut, which provides pilotage services in the Western Australian ports of Dampier and Cape Preston as well as in the Tiwi Islands, engaged IMC to act as owner's representative throughout the project, which resulted in Dongara Marine delivering the 19.2 m aluminium-hulled pilot boat in June.

AMG Winyama, built by Dongara Marine
(Photo courtesy Dongara Marine)

"Argonaut is a very hands-on business, so it was far more effective and efficient for us to have the boatbuilding experts build the boat while we got on with our core business — delivering safe, reliable, and flexible pilotage services," explained Argonaut's Managing Director, Kim Lyons.

"Seeing the original *Berkeley* gave us every confidence that Dongara Marine could produce the pilot boat Argonaut needed, but we also knew that having IMC's shipbuilding and naval architecture expertise overseeing the project for us would add value and reduce risk," he added.

IMC's services were provided across the acquisition and construction period included pre-contract specification review, construction inspection, specification compliance, and reporting, and contract compliance.

"Being involved from the pre-contract stage through to delivery, we were able to use IMC's in-house technical expertise to help align what Argonaut required and what was practically achievable in a design and construction sense," said IMC's Managing Director, Justin McPherson.

Both Argonaut and Dongara Marine made it clear that IMC's ability to apply its expertise in a customer-focused manner, working closely with both owner and boatbuilder, contributed to the newbuilding project's success.

"The IMC owner's representative focussed on making sure that the Berkeley-class pilot boat would meet Argonaut's expectations," said Rohan Marr, General Manager at Dongara Marine.

"Taking a collaborative approach, he worked constructively and efficiently with the Dongara Marine team, recognising that we all had the same goal: client satisfaction. Diligent but fair throughout the build process, IMC made valuable contributions which assisted us achieve the excellent result we did."

Kim Lyons thanked both, saying "We are very happy with *AMG Winyama*, and credit for that goes to everyone involved. You couldn't get a better combination than Argonaut, IMC and Dongara Marine."

For his part, Justin McPherson also acknowledged the pilot boat builder's positive approach to dealing with IMC and Argonaut's inputs.

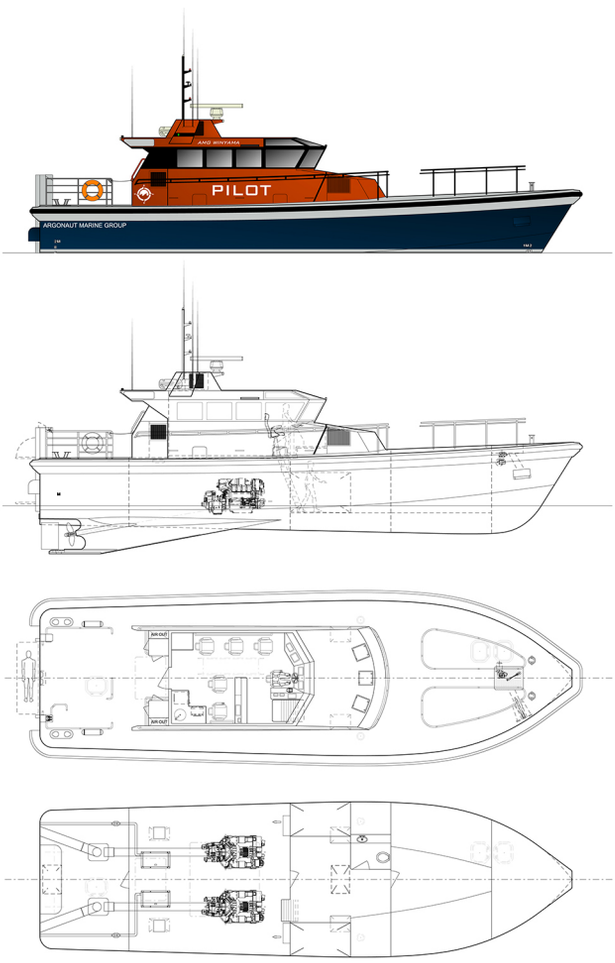
"We found Dongara Marine to be very receptive to our inputs, and it was clear that they wanted to provide a high-quality vessel for our common client," he said.

Argonaut is the latest in a line of commercial and government organisation to utilise IMC's technical and commercial expertise to help ensure that their vessel acquisition program efficiently translates the initial vision into successful operational capability. The Western Australian company's track record in acquisition management now includes patrol boats, research vessels, landing craft, aquaculture boats, training vessels and pilot boats.

About *AMG Winyama*

AMG Winyama will work out of the Port of Dampier, Western Australia. Argonaut placed the order with Dongara Marine after being impressed by the performance and quality of the first Berkeley-class pilot boat.

Developed to enhance safety and comfort for marine pilots, the design leverages the experience with high-speed fishing, patrol and offshore crew boats which resides within Southerly Designs. The design's ability to safely transfer marine pilots to ships in heavy weather has been proven by *Berkeley*, which has been in service at



General Arrangement of *AMG Winyama*
(Drawing courtesy Dongara Marine)

the Port of Fremantle since June 2015. Southerly Designs has been at the forefront of high-speed aluminium vessel design for almost two decades. There are currently over 400 Southerly Designs vessels operating in diverse roles globally. They range in length from 5 to 52 m.

The generous waterline length of the Berkley-class design contributes to its seakeeping performance, while also improving propulsion efficiency. Twin keels and full-size pintle-hung rudders provide exceptional directional stability, increased manoeuvrability, and roll damping. Coupled with extra-wide side decks and first-class WA-made Northern Star fendering system, these attributes make for a very safe working platform for pilots and crew.

Berkeley operated for more than 3000 hours in her first year, and the heavy workload which pilot boats face is reflected in the specification of proven equipment which is rated for intensive commercial use. An example is the selection of twin MTU 8V 2000 M72 main engines at MTU's 1B (Heavy Duty) rating.

Completed by Twin Disc gearboxes and Nakashima propellers, the propulsion package gives *AMG Winyama* a fully-loaded cruising speed of 25.5 kn and 29.5 kn at 100% MCR. Penske Power Systems supplied the engines and Kohler gensets.

To deliver *AMG Winyama* quickly, Niche Marine was contracted to fabricate the robust aluminium hull, which was trucked to Dongara Marine as a bare shell ready for the mechanical installation, fitout, and addition of the resin-infused composite wheelhouse. This approach resulted in a build time of just over seven months.

The use of composites results in a very lightweight yet durable cabin which is protected against corrosion issues throughout its life. It also provides insulation from the extreme heat which *AMG Winyama* will experience in the Pilbara. Further enhancing conditions for those onboard, the wheelhouse is resiliently mounted, resulting in very low noise and vibration levels, while Dongara Marine's composite construction techniques provide a near-superyacht finish inside and out.

Also contributing to providing pilots and crew with a quiet, comfortable workplace is Dongara Marine's high-quality interior fitout. This is evident in features such as padded vinyl linings and the carbon-fibre-and-leather dash. Direct glazed windows provide unrivalled 360-degree visibility and are fitted with reflective blinds to reduce heat transfer. Six Shockwave military-specification shock-mitigating seats add to the exceptional ride provided by the Berkeley-class hullform, whilst the ergonomic dash enables the skipper to easily access the full array of electronics.

These electronics include two Furuno Navnet multi-function (plotter, sounder, and radar) displays with 36 cm glass touchscreens (with a third screen at the dedicated pilot position). Dash clutter is reduced by a customised FinScan IntelliCORE digital switching system which enables switching for all circuits that require wheelhouse control — such as electrics, tank gauges, vessel alarms, and electrical supply — to occur on a single 25 cm touchscreen.

Established in 1975, Dongara Marine is a Western Australian company based at Port Denison which provides specialist marine service and advice to the marine sector. It has been involved in the construction of vessels in fibreglass, aluminium and timber since its inception. Its expertise extends from large commercial vessels to restoration and maintenance of historic timber yachts and launches.

New Inspection Features for PropCad Premium

The latest addition, Inspection Maps, allows PropCad users to create customised layout templates for measuring blade coordinates, blade thickness, and local pitch.

It is common practice to inspect marine propellers to ensure that the manufactured product meets the thickness and pitch specified by the designer. PropCad Premium introduces a powerful tool for propeller builders and manufacturers — Inspection Maps.

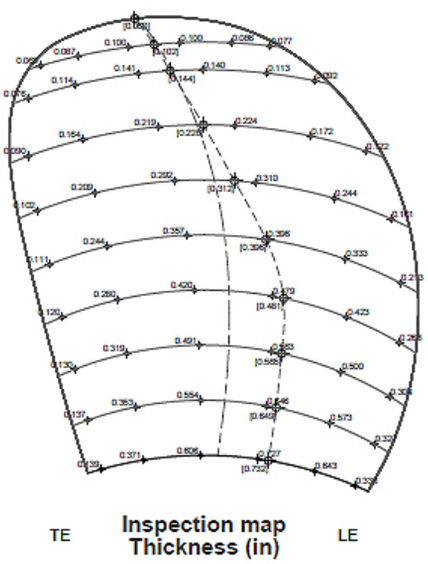
Overview

HydroComp's Inspection Maps is a tool to aid in the measurement and inspection of marine propellers during the manufacturing process. These maps provide guidance for propeller craftsman and foundry workers, allowing them to quickly identify the inspection points on the blade and ensure appropriate thickness and local pitch values.

Inspection Maps

PropCad includes four inspection maps for determining inspection-point location and inspection values for thickness and local pitch. These maps produce a template of the developed blade outline, which can often be directly laid on top of constant-pitch propellers to approximate the inspection point position. Alternatively, the location maps can provide the exact location in 3D space. The inspection maps which are now featured in PropCad Premium are:

- Thickness map — This template provides the local thickness values of the blade at each inspection point. The maximum thickness is also identified and labeled separately.
- Local pitch map — This template provides the measured value of local pitch for a segment of the blade surface at each inspection point.
- XYZ location map — This template provides the coordinates of the inspection points in a Cartesian coordinate system. Each inspection point has an X value representing the axial height of the blade at a specified Y and Z ordinate from the shaft axis.
- X-R-Theta location map — This template provides the coordinates of the inspection points in a cylindrical coordinate system. Each inspection point has an X value representing the axial height of the blade at a specified radius (R) and angle (Theta) from the shaft axis.



A thickness map
(Image courtesy HydroComp)

About HydroComp

Celebrating its 30th year of operation in 2015, HydroComp provides software and services for resistance and propulsion prediction, propeller sizing and design, and forensic performance analysis. HydroComp is proud to have served over 700 industry, research, academic, and government clients from more than 60 countries.

For more information visit www.hydrocompinc.com

Wärtsilä in Coalition to Promote LNG as a Marine Fuel

Wärtsilä and other leading marine industry players have formed a coalition, known as SEA/LNG, to accelerate the widespread adoption of liquefied natural gas (LNG) as a marine fuel. The coalition aims to help break down the barriers hindering the global development of LNG in marine applications, thereby improving the environmental performance of the shipping industry.

In addition to Wärtsilä, the other partners in the SEA/LNG coalition include Carnival Corporation, DNV-GL, ENGIE, ENN Group, GE Marine, GTT, Lloyd's Register, Mitsubishi, NYK Line, Port of Rotterdam, Qatargas, Shell Downstream and Tote. Each member organization commits mutually-agreed human resources, data analysis, and knowledge sharing in support of the SEA/LNG initiatives and activities.

"This is a strong coalition combining the expertise of major fleet owners, classification societies, port facilities and energy experts. Wärtsilä contributes its vast experience and know-how in gas-driven propulsion systems and the entire gas value chain. By working together, we plan to overcome the challenges and speed the general acceptance of LNG. Having been a pioneer in the use of LNG as a marine fuel and a developer of major technologies facilitating the adoption of LNG fuel, it is natural that Wärtsilä supports wholeheartedly the aims of the SEA/LNG coalition," said Timo Koponen, Vice President, Flow and Gas Solutions, Wärtsilä Marine Solutions.

LNG offers significant environmental advantages for shipping compared to heavy fuel oil (HFO), which remains the predominant fuel used today. By comparison with HFO, NOx emissions are cut by approximately 85%, SOx emissions are almost completely eliminated since natural gas contains no sulphur, and particle production is practically non-existent, thanks to the efficient combustion of natural gas, a fuel with almost no residuals.

The main areas of focus for the coalition include supporting the development of LNG bunkering in major ports, educating stakeholders on the risks and opportunities in the use of LNG fuel, and developing globally-consistent regulations for cleaner shipping fuels.

New Hybrid UK Ferry

A new ferry being built at the Cemre shipyard in Turkey for UK operator Wightlink will feature a comprehensive range of modern Wärtsilä equipment and systems to ensure a high level of environmental efficiency. In addition to conventional fuel, the new vessel will be the first ferry to utilise Wärtsilä's hybrid battery technology to improve efficiency, reduce exhaust emissions and lower the noise level.

The scope includes four 6-cylinder Wärtsilä 20 generating sets, electrical and automation (E&A) systems, and a sanitary discharge system. Among the E&A systems to be supplied are an integrated automation system (IAS), a power and energy management system (PMS/EMS), and a 690 V main switchboard. The specification for the order was agreed in September 2015, and a contract signed with Cemre shipyard in June 2016.

The ferry will serve the crossing between the Isle of Wight and the English mainland, and the Wärtsilä solutions will make it the most environmentally-sustainable vessel ever on this route. A notable contributor to this is the Wärtsilä hybrid management system. This enables a significant energy improvement over conventional systems by running the engines at optimal load and absorbing many of the load fluctuations using batteries.

The New Wightlink ferry design
(Image courtesy Wärtsilä)

"This new Wightlink ferry is designed to be energy efficient and environmentally sustainable using the latest Wärtsilä technologies. In particular, the use of Wärtsilä's hybrid system represents a state-of-the-art solution for propulsion efficiency which, in turn, has a beneficial effect on exhaust emissions," said Stephan Kuhn, Vice President, Electrical and Automation at Wärtsilä.

"Wightlink carries more than four-and-a-half million passengers each year and is the leading cross-Solent ferry company connecting the south coast of England with the Isle of Wight. Our new vessel will be Wightlink's flagship, and we thank Wärtsilä for their close cooperation in this project. We are confident that the Wärtsilä equipment and systems are exactly the right choice for this modern ferry," said Wightlink Operations Director, Elwyn Dop.

Delivery of the Wärtsilä equipment is scheduled to commence in spring 2017, and the vessel will enter service in 2018.The vessel will feature two fixed vehicle decks to hold the equivalent of 178 cars, and will have space for more than 1000 passengers. In addition to the propulsion machinery, E&A systems, and sewage treatment, Wärtsilä is also supplying technical and project management, and solution integration engineering services.

Wärtsilä has been an active proponent of environmentally-sustainable propulsion solutions for shipping, notably through introducing engines capable of running on LNG, ethylene and bio-fuels, and then supporting the technology with the appropriate storage, supply and control systems. The company is also a leader in developing battery-powered propulsion solutions for shipping. The company's hybrid system involves the use of both conventional marine engines and batteries. The solution offers environmental benefits since exhaust emissions are considerably reduced.

Wärtsilä to Power two new Indian Dredgers

Wärtsilä has won an order for two new 8000 m^3 trailing suction hopper dredgers being built for the Adani group, India's largest private multi-port operator. The vessels are the first of a new IHC Beagle series designed by Royal IHC (IHC) of the Netherlands. IHC will also build the dredgers. The contract with Wärtsilä was signed in February 2016.

The Wärtsilä scope of supply comprises two 8-cylinder Wärtsilä 32 main engines for the first vessel, and two 7-cylinder Wärtsilä 32 main engines for the second one, together with four Wärtsilä CPPs with shafts. In addition, Wärtsilä will supply a Super Trident sewage-treatment plant with vacuum generation for both vessels. Delivery of this equipment will commence in September 2016. The first of the dredgers is scheduled for delivery to the customer in the end of 2017.

Wärtsilä has considerable experience in providing propulsion solutions for dredgers, and has worked closely with IHC, with whom the company has a strategic alliance. The engines selected for these vessels have exactly the right output power for the ships' operational profiles and will be tuned accordingly.

"We are very familiar with Wärtsilä's propulsion solutions, and are confident that they are a good choice for this new series of dredgers. The vessels will feature high levels of efficiency and maximum uptime, and the reliability and excellent performance of Wärtsilä's main engines are key contributors to this," said Sander Korving, Director Supply Chain Management of Royal IHC.

"We congratulate IHC on producing this latest dredger design series, and we are proud to have been selected to provide the propulsion machinery. Wärtsilä's global manufacturing resources offer important customer support since, regardless of whether future vessels in this series are built in Europe or Asia, we can produce the needed equipment locally," said Aaron Bresnahan, Vice President, Sales, Wärtsilä Marine Solutions.

Wärtsilä has previously supplied equipment to IHC, while for dredgers and other port vessels owned by Adani, Wärtsilä has delivered its Vessel Fleet Management and Remote Monitoring systems.

The new 8000m³ trailing suction hopper dredgers being built for the Adani group will be powered by Wärtsilä
(Photo courtesy Royal IHC)

Australian Ballast Water Regulations

Ballast water has been regulated by the Australian Government since 2001 under the *Quarantine Act 1908* and Quarantine Regulations 2000. From 16 June 2016, the *Biosecurity Act 2015* (Biosecurity Act) replaces the Quarantine Act as Australia's primary piece of legislation used to manage the biosecurity risks posed by ballast water and sediments.

The Department of Agriculture and Water Resources is the lead Australian Government agency responsible for regulating the management and discharge of international ballast water inside Australian seas (the area within 12 n miles of the Australian coastal baseline).

A recently-published document, *Australian Ballast Water Management Requirements, Version 6*, provides guidance on how vessel operators should manage ballast water when operating within Australian seas in order to comply with the Biosecurity Act. It is available for download from the Department of Agriculture and Water Resources website, www.agriculture.gov.au.

Background

Ballast water taken up at international ports and coastal waters outside Australia's territorial sea is considered high risk. Vessels which have taken up high-risk ballast water should only discharge in Australian seas if the biosecurity risk of the ballast water has been managed using an approved method.

Severe penalties may apply if a ballast-water discharge does not meet the requirements prescribed by the Biosecurity Act. It is the master's responsibility to ensure that all ballast water discharges are consistent with the requirements prescribed by Chapter 5 of the Biosecurity Act.

Australian State and Territory Governments' Requirements

The Biosecurity Act introduces new national domestic ballast-water requirements to reduce the risk of spreading marine pests that have already established in Australian seas.

These domestic ballast-water requirements will not be mandatory from June 2016. Domestic ballast-water regulations will be introduced at a later date, to be consistent with the International Convention for the Control and Management of Ballast Water and Sediments (BWM Convention) when it comes into force. Until that time, Section 265 of the Biosecurity Act will not apply. This means that vessel masters must comply with all relevant requirements for ballast-water management, including state and territory law.

Victorian Ballast-water Requirements

The State of Victoria has requirements for the management of Australian-sourced domestic ballast water which are enforced by the Victorian State Government Environment Protection Authority (EPA Victoria) under the *Environment Protection Act 1970* (Vic.)

Victoria's requirements regulate the management of ballast water taken up within Australia's territorial sea and within domestic ports. EPA Victoria requires all vessels intending to visit a Victorian port to submit a ballast-water report form detailing the origin of all ballast water on board. No domestic ballast-water discharge is permitted in Victorian waters unless approval has been granted by EPA Victoria in writing.

If domestic ballast water is intended to be discharged within Victorian waters (less than 12 n miles off the coast) and ports, it must be managed in accordance with the Victorian domestic ballast-water management requirements. Victorian requirements can be viewed and downloaded from the EPA Victoria website, www.epa.vic.gov.au/water/ballastwater/default.asp.

Adapted from Australian Ballast Water Management Requirements, Version 6

MEMBERSHIP

Australian Division Council

The Council of the Australian Division of RINA met on Wednesday 8 June 2016 by teleconference under the chairmanship of our new President, Dr Martin Renilson. The meeting was also the first attended by new members A/Prof. Michael Woodward, Mark Devereaux and Tom Dearling following their respective nominations by Tasmania, Queensland and ACT Sections. The SA&NT Section was still to make a nomination while Sue-Ellen Jahshan (NSW) was unable to attend.

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

Division Vision Statement

Council continued its consideration of future potential activities that had flowed from Dr Armstrong's column in *The ANA* of February 2015.

Under the guidance of our new President, it is taking the form of a vision statement based on the objects of the Institution. Following the discussion, Council members were asked to provide written comments to the President soon after the meeting to enable the document to be finalised.

Australian Naval Shipbuilding and Repair Capability and Government Initiatives

Noting that the Council meeting was held in the middle of a federal election campaign, Council agreed that it was premature to take any action in response to the 2016 Defence White Paper.

However, Council agreed to discuss inter-sessionally possible follow-up action to the Division's submission to the Senate Economic References Committee inquiry into Defence's Physical Science and Engineering workforce. Following the Council meeting it was found that the Committee had reported shortly before the election was called, and this report is being taken into account in those inter-sessional discussions which are on-going as we go to press.

Joint Board on Naval Architecture

Council received a report by Jim Black, the new Chair of the Joint Board, on the Board's meeting on 13 May. As the Board had not met for some time, matters considered were mainly in connection with renewal of cooperation between the Division and Engineers Australia (EA) in relation to:

- EA's fee policy for RINA members attending EA technical meetings.
- RINA liaison with Australian Society of Defence Engineers.
- Naval architecture background of EA members of Joint Board.
- RINA–EA cooperation in relation to parliamentary submissions.
- Revision of National Engineering Register (NER) naval architecture competencies.
- EA involvement in PACIFIC 2017 IMC as an organising institution.

The Board is scheduled to meet again towards the end of the year.

Walter Atkinson Award for 2016

Council noted that nominations for the award would close in mid-July after the end of the year in which qualifying written papers were presented/published, and approved the appointment of the panel to review the nominated papers.

Following the close of nominations, papers to be considered are:

Macfarlane, G. (2015), *Predicting and Regulating Vessel Generated Waves within Sheltered Waterways*, Proceedings Pacific 2015 International Maritime Conference, RINA and IMarEST, Sydney (nominated by NSW Section).

Denehy, S.P., Duffy, J.T., Ranmuthugala, D. and Renilson, M.R., (2015), *Mooring Arrangement Design to Minimise Berthed Ship Motions due to a Passing Ship*, Proceedings Pacific 2015 International Maritime Conference, RINA and IMarEST, Sydney (nominated by NSW Section).

Peace D, (2016), *Introducing a concept for a "Not Normally Manned" Floating Production Unit*, presented at AOG 2016, Perth (nominated by WA Section).

Jeremy, J.C., (2015), *The Flexible Multi-role Warship*, (The ANA, August 2015)

Renilson, M.R., (2015), *Extending the Range of a Conventional Submarine by Autonomous Covert Refuelling when on Patrol,* (The ANA, November 2015)

Smith, A.C., Dunworth, R.J and Helmore, P.J., *Towards the Implementation of a Generalised Inclining Method for the Determination of the Centre of Gravity,* (The ANA, February 2016)

Jeremy, J.C., (2016), *The 21st Century Aircraft Carrier,* (The ANA, May 2016)

London Council Meeting

Council received a report on the outcome of the London Council meeting held on 6 April. It was the last Council meeting under the outgoing President, Bruce Rosenblatt. The next meeting on 9 August would be chaired by new President, Tom Boardley.

While the matters considered by Council were largely routine reports of committees, the August meeting was expected to consider the report of the working group in relation to the re-organisation of the technical committees.

Next Meeting of Council

The next meeting of the Council of the Australian Division will be held on Wednesday 21 September 2016 at 1400 Eastern Standard Time (1200 Western).

Rob Gehling
Secretary

Continuing Professional Development

Continuing Professional Development (CPD) is the systematic maintenance, improvement and broadening of knowledge, understanding and skills, and the development of the personal qualities, necessary to carry out professional and technical duties throughout a member's working life. Continuing Professional Development will therefore enable the member to:

- Update professional competence, so that practice is fully in line with current requirements.
- Develop personal and management skills.
- Broaden experience leading to new career opportunities.

Continuing Professional Development can be achieved through a range of activities, both in and outside the workplace, which are related to members' careers as professional engineers. The types of activity which contribute towards members' Continuing Professional Development and their obligations as a member of the Royal Institution of Naval Architects are described in the RINA publication *Guidance on Continuing Professional Development* available at www.rina.org.uk/guidance_notes.html.

All Fellows, Members and Associate Members who are in or seeking active work are required to take all reasonable steps to maintain and develop their professional competence and knowledge after election. The Institution requires that members achieve a minimum of 35 hours of CPD activity per annum. However, it is expected that most members will exceed this amount.

The Institution requires that CPD activities should be authenticated either by mentors, employers or the providers of CPD. Some informal learning activities may be self-authenticated. The roles of the mentor, employer and the Institution in assisting members to achieve their CPD are described in the *Guidance* document.

The Institution places an obligation on its members to plan and record their CPD and to produce evidence of their CPD achievement. The Institution may request to see a member's CPD Plan and Record at any time, and when upgrading class of membership.

RINA Council and Committee Members

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

Australian Division

President	Martin Renilson
Vice-president	Jesse Millar
Secretary	Robin Gehling
Treasurer	Craig Boulton
Members nominated by Sections	
	Sue-Ellen Jahshan (NSW)
	Marc Deveraux (Qld)
	Tom Dearling (ACT)
	Kalevi Savolainen (WA)
	Karl Slater (Vic)
	Michael Woodward (Tas)
	TBA (SA&NT)
Members elected or appointed by Council	
	Jim Black
	Gerard Engel
	Danielle Hodge
	Craig Hughes
	Jesse Millar
	Mark Symes
	Matthew Williamson

ACT Section

Chair	Tom Dearling
Deputy Chair	Ray Duggan
Secretary	Jason Steward
Assistant Secretary	Alistair Smith
Treasurer	Claire Johnson
Nominee to ADC	Tom Dearling
Members	Richard Dunworth
	Martin Grimm
	Warren Smith
	John Colquhoun

NSW Section

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

Queensland Section

Chair	Mark Devereaux
Deputy Chair	Tommy Ericson
Secretary	Hamish Lyons
Treasurer	James Stephen
Nominee to ADC	Mark Devereaux
Members	Nick Bentley
	Sasha Harrison
	Adam Podlezanski
	Andrew McDonald-Smith

South Australia and Northern Territory Section

Chair	Graham Watson
Deputy Chair	Malcolm Morrison
Secretary	Danielle Hodge
Treasurer	Danielle Hodge
Nominee to ADC	TBA
Members	Peter Dandy
	Nik Parker
	Sam Baghurst

Tasmanian Section

Chair	Jonathan Binns
Secretary	Mark Symes
Treasurer	Jonathan Duffy
Nominee to ADC	Michael Woodward
Members	TBA

Victorian Section

Chair	Andrew Mickan
Secretary	Siobhan Giles
Treasurer	Trevor Dove
Nominee to ADC	Karl Slater
Members	Joseph Cook
	Colin Johnson
	Lance Marshall
	Jack Osborne
	Hugh Torresan

Western Australian Section

Chair	Yuriy Drobyshevski
Deputy Chair	Nick Bentley
Secretary	James Barton
Treasurer	Andrew Phillips
Nominee to ADC	Kalevi Savolainen
Member	Vesna Moretti
	Matthew Williamson
	Timothy Brazier

The Australian Naval Architect

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

Walter Atkinson Award Committee

Chair	Kim Klaka
Members	Lance Marshall
	Alan Muir

RINA London

Board of Trustees	Rob Gehling
Council Members	Martin Renilson (*ex officio*)
	Rob Gehling
Safety Committee	Robin Gehling
High-speed Vessels	Tony Armstrong

RINA/Engineers Australia Joint Board of Naval Architecture

Chair	Jim Black
Member	Robin Gehling

National Engineering Register Naval Architecture Competency Panel

In recess

Pacific 2017 IMC Organising Committee

Chair	John Jeremy
Members	Adrian Broadbent
	Stuart Cannon
	Tauhid Rahman (representing IMarEST)

Pacific 2017 IMC Program Committee

Chair	Adrian Broadbent
Members	Craig Boulton
	Ganga Prusty
	Martin Renilson
	Karl Slater
	Jason Steward
	Tauhid Rahman (representing IMarEST)

Changed contact Details?

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

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

RINA London		hq@rina.org.uk
Australian Division		rina.austdiv@optusnet.com.au
Section	ACT	rinaact@gmail.com
	NSW	rinansw@gmail.com
	Qld	hamish@oceanicdesign.com.au
	SA/NT	danielle.hodge@defence.gov.au
	Tas	mfsymes@amc.edu.au
	Vic	siobhan.giles@dsto.defence.gov.au
	WA	rina.westaus@gmail.com

Phil Helmore

THE AUSTRALIAN NAVAL ARCHITECT

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

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

Photographs and figures should be sent as separate files (not embedded) with a minimum resolution of 200 dpi. A resolution of 300 dpi is preferred.

NAVAL ARCHITECTS ON THE MOVE

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

Peter Crosby has moved on within the SEA 1000 Future Submarine Program and has taken up the position of Support System Integration Manager seconded from ASC in Adelaide.

Bex Dunn graduated from her Bachelor of Marine Science degree in Physical Oceanography with Honours Class 2 Division 1 from the University of Tasmania in 2014. She then spent a couple of months as a science volunteer aboard RV *Revelle* in early 2015 on the Tasman Tidal Dissipation Experiment, a couple of months in the USA in late 2015, and managed to fit in working for the Lark Single Malt Whisky Distillery and another Launceston–Hobart yacht race in the meantime. She has now taken up a position with Geoscience in Canberra.

Peter Hatton has moved on within Lloyd's Register and has joined the office in Sydney.

Caitlin Hoey has moved on within Defence's Civilian Engineering Development Program and has been posted to Lloyd's Register for a six-month placement in Sydney.

Hugh Hyland retired from his position as Assistant Director of Engineering with the Department of Defence in December 2015. Hugh graduated with his BSc(Tech) degree in naval architecture 1970, in the fifth graduating class from UNSW Australia, along with Bryan Chapman, John Garbutt, Phil Helmore, John Sutherland and Pierluigi Vide. He spent his entire career with the Department of Defence, in Technical Services in Sydney at Garden Island and Cockatoo Island and, from 1992, in Western Australia at HMAS *Stirling* covering naval architecture, marine engineering and quality assurance of navy, army and air force assets, refits, dockings and upgrades.

Steve McCoombe has moved on from NSW Roads and Maritime Services and has taken up the position of Senior Naval Architect in the Domestic Vessels Division with the Australian Maritime Safety Authority in Sydney.

Stuart McDonnell moved on from the Australian Maritime College in 2004 and, after some time at Almasts Australia and Crondall Energy Consultants, joined OMV where he has now moved into the position of Senior Project Manager in Vienna, Austria.

Simon McGoldrick moved on from Crowther Design in 2004 and, after some time at Peter Lowe Design, spent the next seven years sailing boats around the world, including a Sydney–Hobart and 20 000 n miles skippering the IMOCA 60, *Hugo Boss*. After a year-and-a-half at Danish Yachts, he has now taken up the position of Naval Architect/Design Coordinator with Alex Thomson Racing in Portsmouth, UK.

David McKellar completed his overseas trip many moons ago and, after some time at Ditchfield Contracting, and Midcoast Water, has taken up the position of Senior Engineer Sewage Treatment and Receiving Environment with TasWater (the trading name for the Tasmanian Water and Sewerage Corporation), in NSW.

Sean Mason moved on from Incat Crowther in 2012 and has taken up the position of Marine Surveyor with the Western Australian Department of Transport in Fremantle.

Laurie Mayer moved on from the Australian Maritime Safety Authority in 2011 and took up the position of Assistant Harbour Master with Marine Safety Queensland in Mackay. He has now moved on within Marine Safety Queensland to the position of Marine Specialist in Mackay.

Misha Merzliakov moved on from Austal Ships in 2012 and, after some time at DOF Subsea, started his own consultancy, Misha Merzliakov Yacht Design, in Brisbane.

Farrokh Mistree moved on from the Georgia Institute of Technology in 2009 and took up the position of Professor in the School of Aerospace and Mechanical Engineering at the University of Oklahoma in Norman, OK, USA.

Carl Morley moved on from Innovatech many moons ago and, after some time at Rolls-Royce Marine in Scotland and Norway, in 2012 took up the position of Product Development Manager with Air Radiators in Lara, Victoria.

Joanna Mycroft continues with Lloyd's Register in Sydney, having completed six weeks in Rotterdam, working with LR's composite engineering gurus.

Paul O'Connor has moved on within Lloyd's Register and has taken up the position of Surveyor-in-charge South Asia Technical Support in Sydney.

Giang Ngo continues consulting as GN Marine in Adelaide.

Ethan Seah has moved on from Singapore Technologies (Marie) and has taken up the position of Managing Director with Ingeliance Singapore in Singapore.

Elisa Taniputra, a recent graduate of UNSW Australia, has moved on from One2three Naval Architects and has taken up a position as a naval architect with Incat Crowther in Sydney.

Carl Vlazny has moved on from Linch-pin Offshore Management Services and has set up his own strategic business, project and risk management consultancy, Black Swan BPR, in Perth, catering to the marine, ship design and construction, and oil and gas industries.

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

Phil Helmore

FROM THE ARCHIVES

The last of the Orient Steam Navigation Company's liners, *Oriana*, arriving in Sydney for the first time on 30 December 1960. With a displacement of 39 100 t she was the largest liner ever built in England and could carry 688 first-class and 1496 tourist-class passengers with a crew of 899. She was designed and built by Vickers at Barrow-in-Furness
(Photo Australian National Maritime Museum, Gervais Purcell collection)

Oriana approaching her berth at the new Overseas Passenger Terminal at Circular Quay. Note the early construction work on two Sydney landmarks — the Opera House and the AMP building. *Oriana* had a service speed of 27.5 kn. She achieved a speed of 30.64 kn on trials at 59 656 kW
(Photo Australian National Maritime Museum, Gervais Purcell collection)

A public room on *Oriana* in December 1960. *Oriana* had a steel hull and an aluminium superstructure. Vickers Chief Naval Architect, the late Roy Turner, a past Vice President of the RINA, was very proud of the ship which competed on the Australian run with the Harland and Wolff built P&O liner *Canberra*
(Photo Australian National Maritime Museum, Gervais Purcell collection)

Oriana at Auckland in 1976. As liner services became unprofitable in the late 1960s, *Oriana* was operated as a cruise ship from 1971 to 1986. She was sold to become a floating hotel and tourist attraction in Japan and, later, China. *Oriana* was severely damaged in a storm in 2004 and was scrapped in China in 2005
(Photo John Jeremy)

A United States Marine Corps MV-22B Osprey aircraft landing on board HMAS *Canberra* off the north-east coast of Hawaii during Exercise Rim of the Pacific (RIMPAC) 2016
(RAN photograph)