THE AUSTRALIAN NAVAL ARCHITECT

Volume 23 Number 3
August 2019

Bristling with toys, the shadow cat *Hodor* was designed by Incat Crowther and built by Astilleros Armón at their Burela shipyard in Spain. The 66.2 m catamaran can carry five tenders (from 7 m to 17 m in length), four jet skis, four quad bikes, an Aurora-5 submarine with its own garage, a helipad, and a large complement of crew, staff and support equipment
(Photo courtesy Incat Crowther)

THE AUSTRALIAN NAVAL ARCHITECT

Journal of
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(Australian Division)

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Cover Photo:

Volcan de Tagoro, a 111 m wave-piercing catamaran ferry, was recently completed by Incat Tasmania for the Spanish operator Naviera Armas
(Photo by Karyn Hannah, courtesy Incat Tasmania)

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From the Division President

Welcome to another great edition of *The Australian Naval Architect.*

I am pleased to report that the internationalisation of the Institution continues. Members may recall that the need to do this was established as a result of the Strategic Review conducted recently by the RINA Board. The Institution has now established the following regions, for which there will be Vice Presidents in due course — UK, Europe, Asia, Pacific, Americas; and Middle East and Africa.

The Vice Presidents for each of these regions will not have any administrative roles but will serve as a coordinating point between members in the region and the Council.

The existing Divisions (Australia and New Zealand) will remain, with the level of autonomy which we have at present. So, to that extent, the change should make little direct difference to those of us in Australia.

On that note, I attended the last Council meeting in London by video conference. This has become a very good way of doing this — much better than the old telephone link. I believe that the ability to participate in this way will encourage more members from outside London to nominate for Council. If you are interested in being nominated for the International Council please let me know.

Since the last edition of *The ANA,* the Institution has had the opportunity to submit a response to the revised *Industry Skills Forecast and Proposed Schedule of Work — Naval Shipbuilding* prepared by Price Waterhouse Coopers for Skills Australia. One of the points that we continue to make is that, as the pre-eminent learned body in the maritime engineering field in Australia and internationally, we can contribute to the work of such reviews. To do so requires a lot of effort on our behalf, and I would like to thank our Secretary, Rob Gehling, for the tremendous amount of work which he puts into this task. Of course, I also thank those members of Council who have been providing input.

In May Peter Dandy, Chair of the SA&NT Section, and I visited the headquarters of the Naval Shipbuilding College (NSC). We had an interesting meeting and we took the opportunity to stress the importance of naval architects to shipbuilding, something which I feel is often overlooked by many in Australia.

The NSC is looking at the whole shipbuilding enterprise, which it defines as the build, sustain, and supply chain. The NSC has four pillars:

1. workforce planning;
2. skilling services;
3. communications; and
4. talent acquisition.

The workforce planning pillar has an advisory committee made up of HR managers from the prime contractors. It is currently developing a shipbuilding jobs taxonomy.

In addition to the headquarters in South Australia, the NSC is also establishing a presence in Western Australia.

It was stressed that the NSC is not going to actually do any training — it is simply a conduit between the training providers and the employers. In that respect, having the word "College" in its title is a bit misleading.

Martin Renilson

As members will know, I like to attend as many of the Section technical meetings as possible. This gives me great opportunities to meet with the Section committees, and to meet with many members in the Sections. I recently attended a SA&NT technical meeting which was held at the University of Adelaide. The SA&NT section regularly holds its meetings there and there are often some students in attendance, which is great for the future of our profession.

At the recent meeting there were over 40 attendees and, in the pub afterwards, somebody commented that the room had possibly contained most of those with current knowledge about naval shipbuilding in Australia. It was said to me that Australia is tending to copy the naval shipbuilding techniques which are used in Europe. But, as many of those shipyards are old, and tend to be constrained by their existing geography, surely we should be developing our own procedures, based on a green-field site. I have worked in two shipyards in Scotland and both were constrained due to their geography, neither being particularly optimal. Of course, they don't exist today. On the other hand, there is a great opportunity to design the new facilities in South Australia, which are not so constrained.

I recall, that as an undergraduate at the University of Glasgow we had two courses on ship production. I vaguely recall the case studies where we looked at some of the (then) modern shipyards in Japan, and compared them with those in the UK. I'm not sure why, but I don't think that we included such courses in the naval architecture degree which we subsequently developed at AMC. Perhaps this was a mistake, and such topics should be included in naval architecture degrees in Australia in the future. This is the sort of subject which needs to be addressed by the relevant Industry Liaison Committees.

As I mentioned in my column in the last edition, the Council has established a liaison committee to coordinate inputs to AMSA on the Domestic Commercial Vessel issues. Although this is led by Council, I am very pleased that it includes members from outside Council on the committee.

Violeta Gabrovska and the Secretary are jointly convening the committee, and any members who would like to provide input should contact the Secretary. I think that it is very important that we engage with AMSA and I'm really pleased to see that we have some enthusiastic members contributing to this engagement.

Final preparations are now underway for Pacific 2019 to be held in Sydney in October. The review process for those papers which the authors wanted reviewed is now complete. I was a wee bit disappointed that some authors didn't make the deadline for review and, as a result, theirs have ended up being non-reviewed papers. We adhered to the deadline very strictly as the length of time which was available for the review process was tight.

I can say that those papers for which I organised the reviews were very good, and received positive comments from the reviewers. In each case the authors were able to address the reviewers' comments well before the deadline. So I am pretty confident that the standard of the papers at IMC2019 will again be high. I am looking forward to the conference and I hope to see as many members there as possible.

Again, the WA Section is planning to host a stream on Offshore Marine Technology at the next Australasian Oil & Gas Exhibition and conference which will be held at the Perth Convention and Exhibition Centre on 11 to 13 March next year. RINA will also have a stand there. I am hoping to be able to attend, and look forward to seeing as many members there as possible.

Whilst on the subject of conferences, the Submarine Institute of Australia (SIA) will be holding its fifth Submarine Science, Technology and Engineering Conference in Perth from 18 to 21 November this year. Our WA Section has been in discussions with SIA, and I believe that a number of our members are likely to be attending this conference, which should be very interesting.

Also, the next Australasian Coasts and Ports Conference will be held in Hobart on 10 to 13 September this year. This has a number of themes of interest to naval architects, including port and maritime engineering, coastal and ocean engineering and the blue economy. I will be attending and hope to see some other members of the Institution there as well.

Finally, I'm pleased to say that the development of our new Naval Architecture career flyer is now complete and it is looking very good. Of course, what we need to do now is to distribute it to those who may be interested to encourage the most able students to enter into our profession. Please contact the Secretary if you would like copies of the flyer. We are going to make sure that the Australian National Maritime Museum has some available and any other suggestions for distribution points are welcome. A/Prof. Michael Woodward has been leading this task and I would like to thank him for coordinating all the various inputs that he has been receiving from Council members.

Martin Renilson

Editorial

The US National Transport Safety Board recently released its independent report into the collision between the destroyer USS *John S McCain* and the tanker *Alnic MC* in the Singapore Strait on 21 August 2017. *John S McCain* was overtaking *Alnic MC* in the westbound lane of the Singapore Strait Traffic Separation Scheme when the destroyer had a perceived loss of steering. While the crew attempted to regain control of the vessel, *John S McCain* unintentionally turned to port into the path of *Alnic MC*. Ten *John S McCain* sailors died, 48 were injured, and the vessel sustained over $US100 million in damage. Damage to the tanker was slight.

The report cites a number of contributing factors, including the decision to transfer the location of thrust control on board *John S McCain* while the vessel was in a congested waterway, the lack of VHF communications between the vessels, the AIS data-transmission policy for Navy vessels, the procedures for the transfers of steering and thrust control on board *John S McCain*, the training of Navy bridge watch standers, the design of the destroyer's Integrated Bridge and Navigation System (IBNS), and Navy watch standers' fatigue [1].

There are lessons from this incident which are relevant to the design of ship's bridges and ship-control systems. In this case, the thrust control of *John S McCain's* main engines was by means of a touch screen on the bridge control stations. At the time of the incident, the watch-station operator assumed that both port and starboard engine controls were linked, or 'ganged', but they were not. An order to reduce the ship's speed resulted in only the port engine slowing, causing the ship to turn to port across the course of the tanker. The NTSB concluded that the touch-screen controls were overly complex and the operators insufficiently trained in their use.

Recently the US Navy has decided to modify destroyers fitted with the IBNS and revert to manual, mechanical controls on the bridge for the ship's propulsion machinery. The changes will be made progressively over the next 18 to 24 months.

Touch screens are now part of our everyday life — our mobile phones, tablets, computers, cars and even some domestic appliances have touch screens controlling a wide range of functions. We are all aware of the occasional complexity of the displays and the difficulty of reading the display in some light conditions. I think that most of us would recoil at the prospect of controlling our car's gears and throttle only by touch screen, preferring the usual manual and clearly-visible alternative (adaptive cruise control is no excuse for a lack of situational awareness). Manual engine controls on ship's bridges are clearly visible to everyone on the bridge as well as the operator and an incorrectly-applied order is immediately evident.

Humans are analogue creatures. Our interface with the digital world is a critical element of design and the change now planned by the US Navy would seem to make sense.

John Jeremy

[1] National Transportation Safety Board (2019), *Collision between US Navy Destroyer* John S McCain *and Tanker* Alnic MC*, Singapore Strait, 5 Miles Northeast of Horsburgh Lighthouse, August 21, 2017*, Marine Accident Report NTSB/MAR-19/01, Washington, DC.

COMING EVENTS

NSW Technical Meetings

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

The program of meetings remaining for 2019 (with exceptions noted) is as follows:

4 Sep Adam Williams, Plan Approval Group Leader, and Jonathan Abrahams, Head of Maritime Advisory, DNV GL
The Propulsion Energy Transition for High-speed and Light Craft

2 Oct Alistair Smith, Naval Architect, Capability Acquisitions and Sustainment Group, Department of Defence
Design and Construction of the RAN's New Arafura-class Offshore Patrol Vessels

5 Dec SMIX Bash 2019

Victorian Technical Meetings

Technical meetings are generally combined with the Victorian Branch of the IMarEST and held on the third or fourth Thursday of each month at the Mission to Seafarers in Docklands.

The program of meetings remaining for 2019 (with exceptions noted) is as follows:

22 Aug IMarEST *TBA*
19 Sep RINA *TBA*
25 Oct Annual Social Event; further details in *News from the Victorian Section* elsewhere in this issue
21 Nov IMarEST *TBA*

Pacific 2019 — IMC2019

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 at the International Conference Centre in Sydney on Tuesday 8 to Thursday 10 October.

Pacific 2019 is the only comprehensive international exhibition of its kind in the Indo-Asia-Pacific region. It will again provide the essential showcase for commercial maritime and naval defence industries to promote their capabilities to decision-makers from around the world. Held in the heart of Sydney and on the shores of one of the world's most beautiful harbours, Pacific 2019 will be the tenth in the series and builds on the highly successful biennial events since 2000.

Specifically developed to satisfy the needs of industry, government and defence professionals across the broad spectrum of maritime affairs, Pacific 2019 is not open to the general public.

The Pacific 2019 website is up and running at www.pacificexpo.com.au, with further details being added as they come to hand. The preliminary programme and registration for IMC 2019 is now available at www.pacificexpo.com.au/imc2019. For further details, contact imc@amda.com.au.

ASRG Dockmaster Courses 2019

DM Consulting's dockmaster course is a four-day course which covers the fundamentals and calculations of dry docking. The next courses in Australia will be held on

Tuesday 15 to Friday 18 October, Sydney; venue TBA
Tuesday 22 to Friday 25 October, Darwin; venue TBA

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

It is designed to be relevant to dock masters, docking officers, engineers, naval architects, port engineers and others involved in the dry docking of ships and vessels. The course is presented through classroom lectures, student participation in projects, and practical application exercises. The course addresses the deck-plate level of practical operation needed by the dock operator and the universally-accepted mathematical calculations required to carry out operations in accordance with established sound engineering practices.

Topics to be covered include:

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

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.

HPYD7

HPYD is the series of conferences on high-performance yacht design organised by the Royal Institution of Naval Architects NZ and the University of Auckland. The first conference was held in December 2002. Since then, the conferences in 2006, 2008, 2012, 2015 and 2018 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.

imc2019

PACIFIC INTERNATIONAL MARITIME CONFERENCE

INTERNATIONAL CONVENTION CENTRE SYDNEY, AUSTRALIA

8 - 10 OCTOBER 2019

ENGINEERS AUSTRALIA

Connect with eminent leading speakers, new technical research and leading-edge maritime technologies at the region's premier maritime technical conference, IMC2019.

Organised by the Royal Institution of Naval Architects, the Institute of Marine Engineering, Science and Technology and Engineers Australia, ***IMC2019*** will be held in conjunction with the prestigious Australian Navy Sea Power Conference and the PACIFIC 2019 International Maritime Exposition.

Two conference streams will highlight new advances, research and technologies across:

- Commercial, Naval and Submarine Ship Technology
- Shipbuilding and Sustainment
- Maritime Environment Protection
- Commercial Ship Operations
- Offshore Resource Industry
- Maritime Safety

IMC2019 Registration will include free access to the PACIFIC 2019 exposition.

Eminent Keynote Speakers include:

Professor Tanya Monro
Chief Defence Scientist
Defence Science and Technology

Sheryl Lutz
First Assistant Secretary Ships
Capability Acquisition and Sustainment Group

Kerry Lunney
Country Engineering Director and Chief Engineer
Thales Australia

Professor Hugh Durrant-Whyte
NSW Chief Scientist & Engineer
NSW Department of Industry

www.pacificexpo.com.au/imc2019

Register now!

For further information

Email: imc@amda.com.au or PO Box 4095, Geelong VIC AUSTRALIA 3220

The High Performance Yacht Design Conference HPYD6 took place in Auckland, NZ, on 10–13 March 2018 during the stopover of the Volvo Ocean Race. Due to a lack of high-quality technical abstracts submitted, the HPYD committee made the decision to change the format of the HPYD6 conference. As such, there was no publication of papers and no formal conference presentations. Instead, there was a focus on providing a range of exciting, publicly-accessible presentations and keynote addresses delivered by some of the top designers and engineers involved in the America's Cup and Volvo Ocean Race.

Planning for HPYD7 has already begun. It will coincide with the America's Cup in Auckland in 2021, and will return to the more traditional format with a full complement of papers and speakers.

You can follow HPYD on Facebook, LinkedIn or sign up for their mailing list to receive the latest news.

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

NEWS FROM THE SECTIONS

ACT

Annual General Meeting

The ACT Section held its Annual General Meeting on 9 April 2019 at the Campbell Park Offices of the Department of Defence.

Office bearers elected for the Section Committee for 2019 are as follows:

Chair	Ray Duggan
Deputy Chair	Joe Cole
Secretary	Alistair Smith
Assistant Secretary	Lily Webster
Treasurer	Kristoffer Grange
Members	George Costas-Inglis
	Daniel Lim
	Peter Hayes
	Warren Smith
	Ahmed Swidan

Slamming loads on Ships

Dr Ahmed Swidan, Senior Lecturer in the School of Engineering and Information Technology at UNSW Canberra, gave a presentation on *Slamming Loads on Ships—the Contributions and Impact of Research* on 19 March at the Campbell Park Offices of the Department of Defence.

The presentation looked at the design issues associated with slamming on high-speed catamarans. This highlighted the work which had been undertaken by academia (UTAS/AMC with Incat) in developing practical ideas which would contribute to reducing maximum slamming loads. The research started by looking at all the tools currently available which might be applied to allow better understanding and potential reduction of the slamming loads experienced. The presentation then stepped through several iterations of computational fluid dynamic models and their results to refine a hull-modelling approach which gave reliable, believable and testable results.

Ahmed then looked at the available physical testing systems, their limitations, and the subsequent interpretation of the results given those known limitations. This approach informed the best way to test a series of physical models which would provide the most reliable and informative results. The results showed that a winged centre-bow design provided significant reductions in the slamming loads experienced in the physical test rig. Also that there is the opportunity for significant optimisation of the concept, which provides both an air space within the enclosed catamaran hulls to reduce the peak slamming pressure, and additional damping to reduce hull accelerations.

It was noted that a winged centre-bow had recently been adopted by Incat. So, ideally, this full-scale experience will further inform the understanding and future development of the winged centre-bow design concept.

Beam Scaling to achieve a Zero-ballast Naval Combatant

Martin Grimm, currently Signatures Cell Lead, and Richard Dunworth, recently-retired Stability Technology Manager, Naval Technical Bureau, Department of Defence, gave a presentation on *Beam Scaling to achieve a Zero-ballast Naval Combatant* on 28 May 2019 at the Campbell Park Offices of the Department of Defence.

Introduction

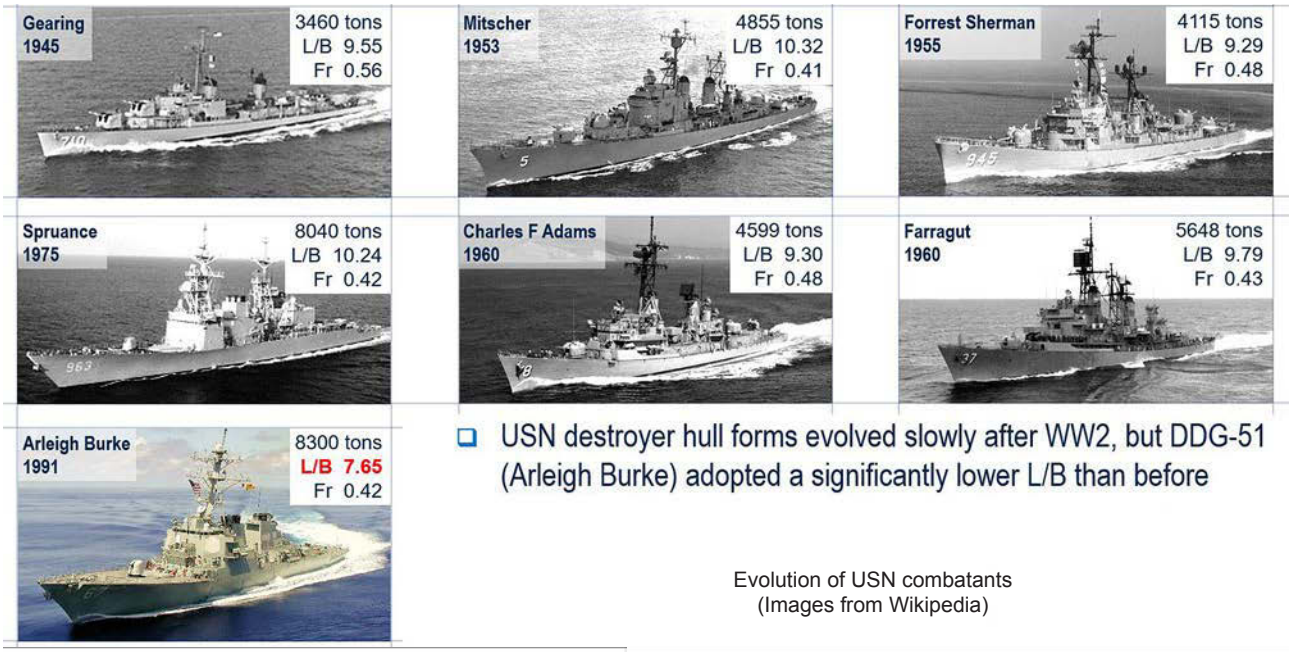
Martin began by saying that their presentation was based on a conceptual study undertaken some years earlier within the Navy Platform Systems directorate in response to a Maritime Development Branch request seeking to understand what would be required to eliminate the need for taking on sea-water ballast as fuel is consumed on a surface combatant. The Anzac-class frigate was used as a basis for the study as its displacement and stability characteristics were well understood.

Analysis

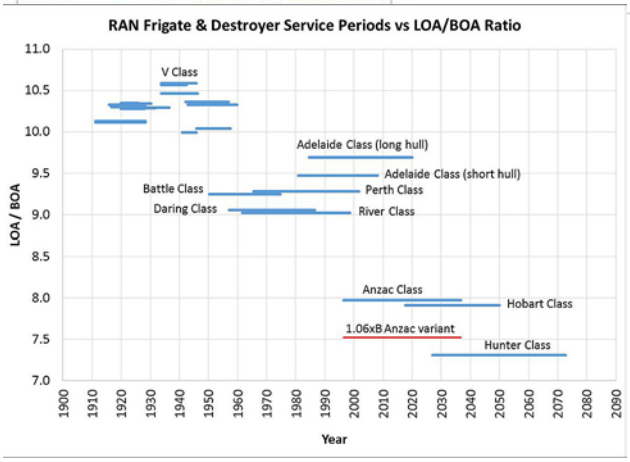
Martin commenced with an historic review of the change in length/beam ratios over time in the United States and Royal Australian Navies, and revisited the old debate regarding the short-fat vs long-thin design philosophy for warships.

In comparison to the USN, the RAN has also shown a trend over time, or at least most recently, towards a reduced length/beam ratio in combatant platforms.

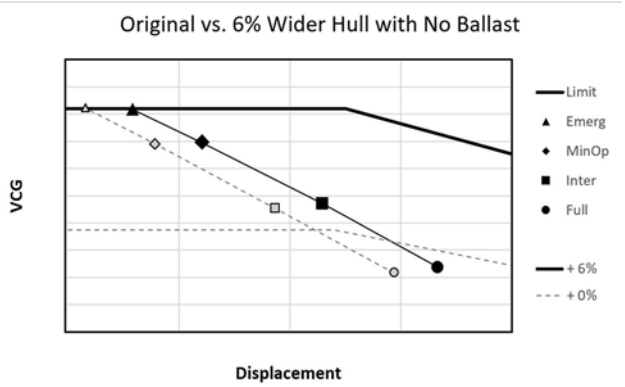
Richard then stepped through the process used to investigate how much wider a frigate design variant would need to be to eliminate sea-water (or even solid) ballast, while still remaining compliant with the RAN stability standard. This included discussion of the design impact of beam changes on displacement, installed power to maintain constant speed (both maximum and cruising), and fuel load to maintain constant range, as well as touching on seakeeping and other design impacts resulting from removal of ballast. Richard elaborated on the underlying stability relationships which enabled a modest beam change to achieve the desired stability results.



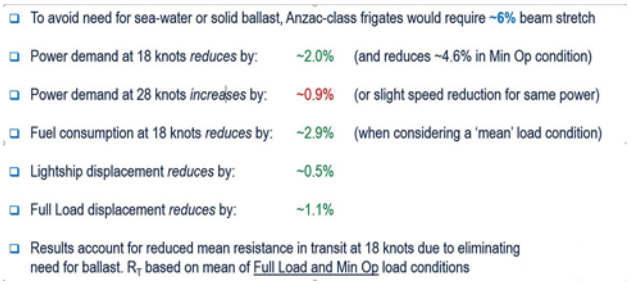
Evolution of USN combatants
(Images from Wikipedia)



Evolution of RAN combatants
(Image courtesy Martin Grimm)



Comparison of operating conditions with limiting KG curves
(Image courtesy Richard Dunworth)



Results of the analysis
(Image courtesy Martin Grimm and Richard Dunworth)

Conclusions

The presentation highlighted the interactions which occur between design elements and concluded (subject to the assumptions used) that the frigate could meet the RAN stability standard without sea-water or solid ballast, with a modest increase in beam (approximately 6%). The diagram shows the limiting KG curves against the fuel usage sequences for both the baseline (+0%) and wider (+6%) variants of the Anzac-class frigate. The load conditions shown are without ballast in both cases. Without sea-water or solid ballast, the original frigate design only meets the RAN stability standard in the full-load condition. The 6% wider variant meets the RAN stability standard in all load conditions: full load, intermediate, minimum operating and emergency arrival.

Such a widened configuration had little or no impact to the operational capability of the platform, with only around a 1% increase in required installed gas-turbine power to maintain the same maximum speed, yet with a 2% reduction in power to maintain constant cruising speed on diesel propulsion. Hence, the average cruising fuel consumption of the wider variant was estimated to be around 3% *lower* than the baseline. These outcomes highlight the potentially counter-intuitive results which can be obtained when multiple design parameters are changed concurrently.

Cavitation about Spheres: The influence of Surface Quality

Daniel Lim, a recent AMC graduate Naval Architect, Naval Technical Bureau, Department of Defence, gave a presentation on *Cavitation about Spheres: The influence of Surface Quality* on 9 July 2019 at the Campbell Park Offices of the Department of Defence.

Introduction

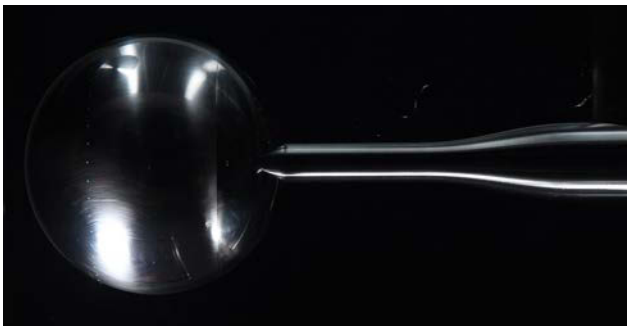
Daniel began by saying that his presentation covered the work which he undertook as part of his final-year thesis project to experimentally investigate the cavitation about bluff bodies and, in particular, spheres. Despite extensive research on streamlined bodies such as foils, little work has been done on bluff bodies. The underlying purpose of

these experiments was to expand on the currently-available knowledge of the physics associated with cavitating flows around bluff bodies.

Analysis

Cavitation about spheres deals with the phenomenon of cloud cavitation, a field of research which remains relatively unknown. Cavitation is an undesirable flow phenomenon due to the noise, vibration and erosion associated with it. The effect of surface roughness in flows susceptible to cavitation was examined in terms of how the interactions between upstream shock-wave propagation and re-entrant jets would affect nucleation, and whether the adverse effects of cavitation could be mitigated. This investigation continued on from previous work done on smooth spheres.

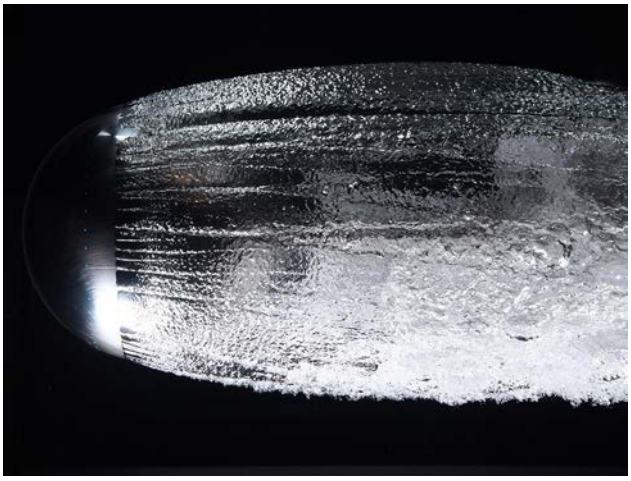
The experiments were conducted using two spherical models of 0.15 m diameter, one constructed from aluminium, and the other from stainless steel. The spheres were sting-mounted on the centreline of the variable-pressure tunnel in the Cavitation Research Laboratory at the Australian Maritime College. Roughness was introduced to the spheres by applying 44 evenly-distributed dots around the circumference of the spheres at 65 degrees from front stagnation. The aluminium sphere used painted dots, while the stainless-steel sphere used stuck-on dots of slightly larger protrusion. The experiments were conducted at cavitation numbers of 0.9 to 0.3 in increments of 0.2, at Reynolds numbers of 6×10^6 and 4×10^6 for the aluminium sphere, and 6×10^6 and 3×10^6 for the stainless-steel sphere.



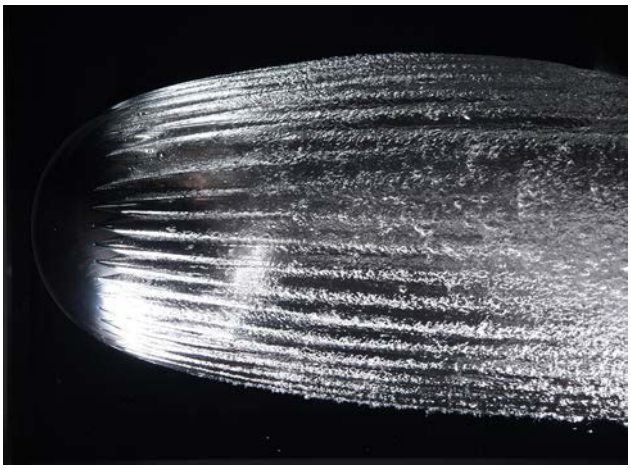
Sphere setup within the cavitation tunnel
(Photo courtesy Australian Maritime College)

High-resolution still photographs were taken and compared to corresponding images of smooth spheres for visual analysis. Additionally, a dynamic pressure transducer was mounted within the cavity-shedding zone for quantitative analysis of results in conjunction with visual data. The power spectral densities of the recorded pressure measurements were analysed using the Welch method. Peaks were found to identify key shedding frequencies at corresponding Strouhal numbers.

From analysis of visual and numerical data, it was found that at intermediate cavitation numbers of 0.7 and 0.5, there was little difference in shedding between the smooth and modified spheres. Photographs showed differences in leading-edge dynamics, but the shedding mechanisms appeared to be similar. At both ends of the cavitation number range, differences in spectral peaks were observed for the higher Reynolds number. At a cavitation number of 0.9, shed cavities were longer with signs of re-entrant jets observed. At a cavitation number of 0.3, fully-turbulent flow was observed with flow separating off the dots. An absence of



Flow around stainless-steel sphere at $\sigma = 0.3$ and $Rn = 3\times10^6$
(Photo courtesy Australian Maritime College)



Flow around stainless-steel sphere at $\sigma = 0.3$ and $Rn = 6\times10^6$
(Photo courtesy Australian Maritime College)

cavity collapse was also seen. At the lower Reynolds number for the steel sphere, the suppression of cavitation was seen for cavitation numbers higher than 0.6.

The development of cavitation at $\sigma = 0.59$ and $Rn = 3\times10^6$ for the stainless steel sphere
(Photo courtesy Australian Maritime College)

Conclusion

Further work is likely to be required to reach a definitive conclusion on the effect of surface roughness on cavitation about a sphere, as consistent results were not observed. However, it was determined that, at low Reynolds numbers paired with high cavitation numbers, cavitation was

able to be suppressed. Furthermore, it was found that at intermediate cavitation numbers, there was little difference in the shedding mechanisms involved. Recommendations for further work include testing spheres with roughness introduced at different angles from the stagnation point, homogeneous dimpling, and larger dots with the aim of altering cavitation shedding at the intermediate cavitation numbers.

Ray Duggan

New South Wales

Committee Meetings

The NSW Section Committee met on 27 May and, other than routine matters, discussed:

- SMIX Bash: Accounts for SMIX Bash 2018 have been finalised, and the *James Craig* venue for 2019 has been paid for.
- Technical Meeting Program 2019: All presentations have been organised, with one seeking approval.
- Recording of Technical Presentations: Engineers Australia have been requested to install freeware on their computer to enable recordings.
- Circulation of Emails to Members: The Gmail account now uses the RINA-supplied addresses in Excel with an added sheet for non-members; non-current members have been requested to reply if they wish to continue receiving emails from the NSW Section and will be added to the non-members sheet.
- Walter Atkinson Award 2019: Papers proposed for nomination.

The NSW Section Committee also met on 16 July and, other than routine matters, discussed:

- SMIX Bash 2019: Invitation letter to sponsors updated and to be sent, and flyer/registration form to be updated; Trybooking website to be set up.
- Technical Meeting Program 2019: All remaining technical presentations confirmed.
- Recording of Technical Presentations: Engineers Australia agreed to install recording software on the computer in the Harricks Auditorium.
- Circulation of Emails to Members: The Gmail account now uses the RINA-supplied addresses in Excel, with sheets added for non-members and kindred institutions, so contact details do not have to be kept on the web.
- Walter Atkinson Award 2019: Two nominations agreed for advice to Australian Division Council

The next meeting of the NSW Section Committee is scheduled for 3 September.

Design and Construction of *White Rabbit*

Steve Quigley, Managing Director, and Rob Tulk, Principal Naval Architect, One2three Naval Architects, gave a presentation on *Design and Construction of* White Rabbit, *the World's Largest Trimaran Superyacht* to a joint meeting with the IMarEST attended by 27 on 29 May in the Mitchell Theatre at Sydney Mechanics School of Arts in Sydney's CBD.

The design and construction of *White Rabbit* was written up in the February 2019 issue of *The ANA*. The presentation enlarged on the write up, with many photographs of the stunning interiors, and images of the CFD and FEA work which was undertaken, together with details of the general arrangement, diesel-electric propulsion train and controllable-pitch propellers, the ride-control devices, and how the owner uses the vessel. If you missed this one, then you missed a great presentation!

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

The vote of thanks was proposed, and the certificates and "thank you" bottles of wine presented, by John Jeremy.

(L to R) Rob Tulk and Steve Quigley accepting their certificates and "thank you" bottles of wine from John Jeremy
(Photo Phil Helmore)

Enabling Highest Uptime at Lowest Total Cost of Ownership

Bert Ritscher, Business Development Manager, Europe, Africa and Middle East, Caterpillar Assert Intelligence, gave a presentation on *Enabling Highest Uptime at Lowest Total Cost of Ownership* to a joint meeting with the IMarEST attended by 36 on 3 July in the Harricks Auditorium at Engineers Australia in Chatswood.

Introduction

Bert began his presentation by saying that you might think of Caterpillar as just the manufacturer of Caterpillar and MaK engines. However, Caterpillar is busy expanding its horizons, via Cat Asset Intelligence, into the field of asset management, and providing digital services to tie in more closely with its customers. The goal is to increase the uptime of assets while reducing the total operating cost.

Reliability and asset-management value is provided by obtaining data from machines and sensors, analysing the data with intelligent analytics, and then providing expert advice in the following areas:

- Equipment management: Avoiding failures and reducing cost of maintenance.
- Productivity: Reducing downtime, increasing productivity and increasing fuel efficiency.
- Safety: Reducing unsafe operations and conditions.
- Sustainability: Ensuring environmental compliance.

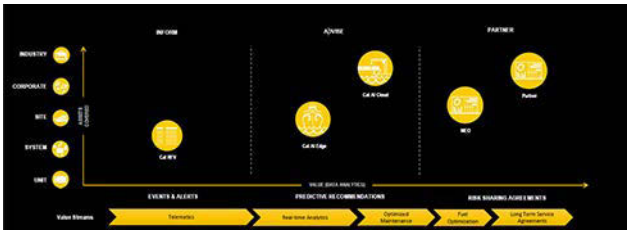
Cat Asset Intelligence

Cat Asset Intelligence (AI) provides three levels of service to customers:

- Inform: Knowing the location, health, and efficiency of the equipment.
- Advise: Increasing the overall operational efficiency, reducing unplanned maintenance costs, optimising maintenance and reducing risks.
- Partner: Risk/gain sharing, providing the highest level of consultative and customised services to enhance the overall digital strategy for reliability and asset management.

Telematics is the gathering of data on board the vessel and its transmission ashore; while analytics is the intelligent analysis of that data and provision of advice based thereon.

Here Bert showed a slide illustrating the three levels of service in the digital portfolio which, in increasing order, deliver the highest uptime at lowest total cost of ownership.



Caterpillar's digital portfolio
(Image courtesy Caterpillar)

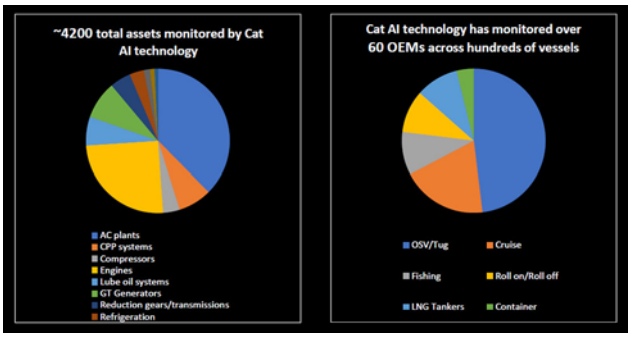
The Inform level offers a simple way to:

- Remotely access information from a single unit or an entire fleet.
- Know more about asset health and performance with the easy-to-use web interface which transforms data into insights.
- Make more informed decisions with accurate information available at your fingertips.
- Reduce repair time and costs with remote troubleshooting, using historical data about events and diagnostics.
- Leverage your dealer's expertise to get higher performance and longer life at a lower total cost from your connected assets

The Advise level creates customer value and solves performance problems with operational analytics applied to many different industries and equipment types by providing:

- Lowest operating cost: Schedule the right maintenance at the right time and location with the right cost.
- Highest uptime: Identify anomalies in a single fleet view for maximum efficiency.
- Customised analytics: Customise operational parameters or let the professionals at Cat AI do it for you.

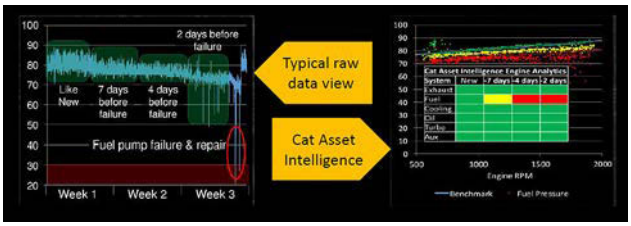
Cat AI has monitored more than 4200 total assets, and more than 60 OEMs across hundreds of vessels.



Cat AI monitoring experience
(Image courtesy Caterpillar)

OSV Case Study

Here Bert provided an example of an engine failure predicted on an offshore supply vessel. Cat Asset Intelligence analytics identified a potential failure of a fuel pump. The issue was not addressed by the crew and, as a result, the failure actually occurred, resulting in repair cost and downtime.



Cat AI prediction of engine failure on an OSV
(Image courtesy Caterpillar)

The vertical axis in the graphs represents pressure.

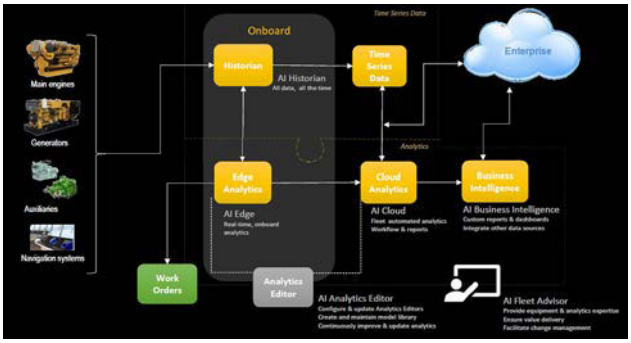
Had the crew addressed the issue, it would have minimised downtime and reduced costs, resulting in a total savings of $53 000.

HVAC Systems Case Study

Cat AI Analytics has monitored and analysed more than 500 air conditioning units. This has enabled significant air-conditioning energy savings (up to $500 000 for a single vessel), and air-conditioning failure avoidance (up to $450 00 for a single failure predicted and avoided).

What is Cat AI Intelligence?

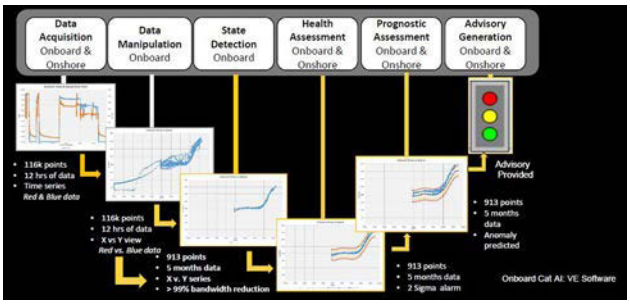
Here Bert showed a diagram of the real-time analytics platform, which includes the industry diagnostics, OEM diagnostics, and the cloud and edge platform.



Cat AI real-time analytics platform
(Image courtesy Caterpillar)

AI's approach to predictive analytics is in accordance with ISO13374-3:2012 Condition Monitoring and Diagnostics

of Machines — Data Processing, Communication and Presentation — Part 3: Communication.

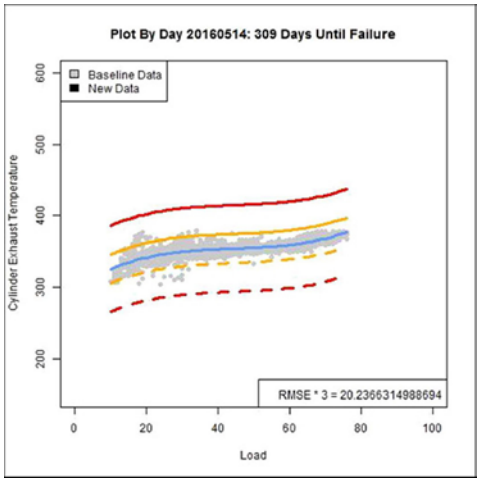


Cat AI predictive analytics
(Image courtesy Caterpillar)

In the right-hand graph, the data can initially be seen to be within the normal bands. However, as time progresses, the data gradually approaches, and then exceeds the upper limit, and an anomaly—or failure!—would be predicted.

Engine Health Case Study

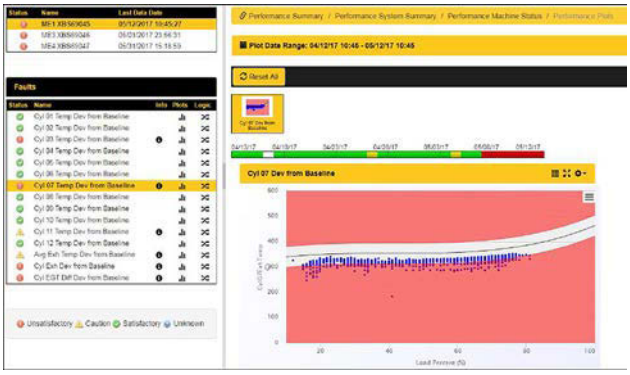
Bert then showed an example of the health of an engine being monitored by the relationship between load and exhaust temperature. Starting 309 days before failure, the relationship is seen to be within the "healthy" boundaries of the plot. The video brought to life the data, which gradually transitioned outside of the "healthy" boundaries. At "-1 Days Until Failure" (or one day after replacement) the data visibly jumped back into the "healthy" boundaries.



Engine health case study
(Image courtesy Caterpillar)

Fuel Pump Injector Case Study

An example was also given of a fuel pump injector leading up to failure.



Fuel pump injector case study
(Image courtesy Caterpillar)

Conclusion

Caterpillar has extended its horizons from the manufacture of diesel engines into the field of asset management and the analysis of condition-monitoring data to better manage the assets in a system. Case studies have shown that significant savings can be made via increasing uptime and reducing total operating costs.

Questions

Bert fielded many questions on the way through his presentation, but question time at the end elicited some further interesting points.

Cybersecurity is not really an issue. Caterpillar uses standard firewalls, and ship-owning companies may also have their own. However, the classification societies will not allow the remote operation of equipment from outside the vessel, so this cannot be hacked. Data only can be transmitted.

Caterpillar has not yet joined the autonomous vessel bandwagon, although Damen has. Caterpillar has entered the field with the big mining trucks which haul the ore and operate autonomously, providing safety, reliability and efficiency.

The raw data which is collected on board the vessel, and the processed data, is all owned by the customer.

Vast amounts of data are collected, for each item of equipment on board a vessel and, hence, for a fleet of vessels. Wider still, for the whole merchant fleet! Caterpillar is not at the stage of monitoring industry-wide data. They can analyse the data for 3500-series engines, in order to build better engines, but not to give the data to others.

Cat AI is happy to provide the analytics for all equipment apart from their own; Caterpillar, MaK, MAN, Cummins, Wartsila, MTU, etc. The customer owns the vessel and has the option to integrate the systems and the data using whichever provider they wish.

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

[*If you are interested in finding out more about Cat Asset Intelligence, then visit www.catassetintel.com*—Ed.]

Bert Ritscher (L) accepting his certificate and "thank you" bottle of wine from Geoffrey Fawcett
(Photo Phil Helmore)

Mitigating Uncertainty in Oscillating-water-column Wave-energy Converters

Jarrah Orphn, PhD candidate at the Australian Maritime College and the recipient of the IMarEST's Laurie Prandolini Scholarship, gave a presentation on *Mitigating Uncertainty in Oscillating-water-column Wave-energy Converters* to a joint meeting with the IMarEST attended by 25 on 7 August in the Harricks Auditorium at Engineers Australia in Chatswood.

Little is known of how scale effects and laboratory effects influence the hydrodynamic modelling of oscillating-water-column wave-energy converters. The laboratory effects have been investigated at the Australian Maritime College by testing a scale model in the Test Basin.

Experiments were then conducted in the Coastal Wave Basin at the Queen's University Belfast, Portaferry, Ireland, a state-of-the-art hydrodynamic wave-basin laboratory. The purposes of the experiments in the Coastal Wave Basin were to confirm the laboratory effects by way of reproducing the experiments previously conducted at the Australian Maritime College, and to test the scale effects inherent in physical modelling by testing two different scales of the same model.

The key parameters of interest in the experiments were the performance of the wave-energy converter in terms of the amount of energy absorbed from the incident waves under normal operating conditions, and the global loads imposed on the model under survival or extreme-wave conditions. These parameters (power and loads) are the two most important parameters to investigate in these wave basin experiments, as converters operating in the ocean have not only to produce power but also to survive the extremely high-energy sea states in storms.

This presentation focussed on wave-energy converters and the results of experiments conducted to determine the scale and laboratory effects. The final results are expected to aid in developing guidelines for hydrodynamic model test experiments of wave-energy converters.

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

Phil Helmore

Victoria

Victorian Section Committee

This month the Victorian Section welcomed two new members to the Committee. Welcome, Jon Emonson (BAE Systems) and Luke Shields (BAE Systems), with Luke promptly setting to work in planning for our 2019 Social Function in October. The Victorian Section is committed to improving member benefits and the increased numbers of members serving on the committee will bring these benefits to bear sooner and with more impact. Both Jon and Luke will bring their energy as well as experience from the front-line of naval shipbuilding in Australia.

Victorian Member Survey

The committee has been assembling a survey for members to better understand what our priorities should be. Expect this in the coming weeks and please support it if you can, so that we can look for opportunities to improve.

Jarrah Orphin (L) accepting his certificate and "thank you" bottle of wine from Alan Taylor
(Photo Phil Helmore)

Construction of the Hunter-class Frigates

Richard Seery, Head of Operations, Hunter Class Frigate, BAE Systems, gave a presentation on *Construction of the Hunter-class Frigates* attended by 46 on 16 May at the Mission to Seafarers in Docklands. Richard brought a wealth of experience with him: he is a Fellow of Engineers Australia, and has 27 years' experience in industry, including ten at BAE Systems, the last two working on the Hunter class.

The presentation covered the development of the localised build methodology and prototyping strategy of the Global Combat Ship to support construction of the Hunter-class frigates in Osborne, SA. Richard's presentation drew the biggest crowd yet seen for a technical presentation in Victoria.

Audience at Richard Seery's presentation
(Photo courtesy Jesse Millar)

On 29 June, 2018, the Australian Government announced that BAE Systems had been selected as the preferred tenderer to deliver nine frigates to the Royal Australian Navy, based on the Type 26 frigate being delivered to the Royal Navy. This platform has since also been selected as the preferred option for the 15 vessels for the Canadian surface combatants. Then, on 14 December 2018, BAE Systems' new subsidiary, ASC Shipbuilding, was awarded the head contract by the Australian Government, providing the framework for the design and build of the Hunter-class

Hunter-class frigate
(image courtesy BAE Systems)

frigates. Prototyping on the Hunter program is expected to start in 2020, and construction on the first ship will begin within 24 months of prototyping commencing.

Additive Manufacturing (3D Printing) in the Oil and Gas Sector

Lee Djumas, Research and Innovation Manager, Woodside Energy Futurelab, Monash University, gave a presentation on *Additive Manufacturing (3D Printing) in the Oil and Gas Sector* on 20 June at the Mission to Seafarers in Docklands. Lee completed his PhD in the Department of Materials Science and Engineering at Monash University, where his topic was *Additively Manufactured Composite Structures*, during which time he began working with Woodside Energy.

Lee began his presentation with a description of the Monash University open-technology research centre which is dedicated to this technology. Much of its funding is provided by the Woodside Petroleum Group of companies.

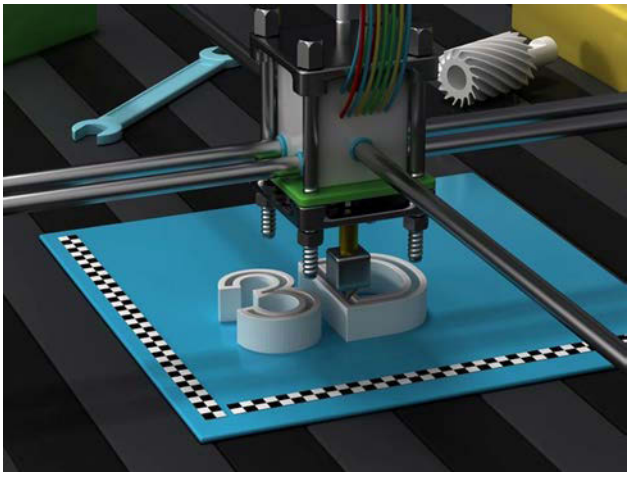
He presented an introduction to additive-manufacturing technologies and applications, followed by case studies highlighting how Woodside Energy, Monash University and their partners are approaching the utilisation of additive manufacturing in the oil-and-gas industry. A focus and point of difference of the Monash research to other centres is its analysis and optimisation of the metallurgical qualities of 3D printed products.

Lee emphasised that this technology should be regarded as just another manufacturing production technology. Whilst not new, he emphasised that it is still under development and the skills required currently take about five years to acquire. Of particular interest was his presentation of research results which showed that the intrinsic strength of 316 stainless-steel products produced using additive techniques was significantly greater than equivalent cast products.

Improving the Management of Under Keel Clearance through Technology

Jack Bucher, Naval Architect, Research Department, OMC International, gave a presentation on *Improving the Management of Under Keel Clearance through Technology* on 19 July at the Mission to Seafarers in Docklands. Jack's work involves the modelling, measurement, and analysis of vessel motions in shallow water, with a particular focus on the effects of wave-induced motions, squat, and heel on under-keel clearance.

OMC is an Australian maritime engineering company which



Additive manufacturing
(Photo courtesy Melissa Yeo)

has developed award-winning e-Navigation technology to improve transit for large commercial ships in draft-restricted entrance channels and waterways. It determines and manages a ship's under-keel clearance (UKC) dynamically and in real-time. OMC has a strong research focus, and its Melbourne-based team of maritime and software engineers continues to commercialise new safety products. These include the automated ship-scheduling tool DUKC® Optimiser which maximises total tide tonnage, and award-winning ship-motion measurement instrument OMC iHeave®.

Bulk carrier with low UKC entering draft-restricted waterway
(Photo from Marine Insight website)

Despite logistics and IT issues (because I failed to book a room!), Jack demonstrated his professionalism and overcame diversity to deliver. The presentation provided an overview of how OMC uses environmental and vessel-motion modelling in combination with real-time measurements and experimental data to increase the safety of draft-restricted transits, while also providing significant economic and environmental benefits over traditional methods.

While there have been numerous advances in surveying and vessel technology, the size of large modern commercial vessels coupled with economic demands make transits at very low UKC unavoidable in many of the world's ports and waterways. Failure to appropriately account for the dynamic factors which can reduce this UKC has resulted in a number of groundings around the world, and OMC is at the forefront of improving the situation.

Annual Social Event

Our annual social event is set to run on 25 October, taking advantage of the warmer spring weather and the additional light having dipped into daylight saving. It will be held at the Common Man, South Wharf, Melbourne. Cost will be $55 per head, including a barbecue station, salad bar and two-hour drinks package.

Lillet Secret Garden at the Common Man
(Photo from Onya Magazine website)

Save this date and expect invitations to be sent in the coming weeks. Please contact the committee for further information and advertising opportunities.

Jesse Millar

Western Australia
New European Towing Tank

Tim Gourlay, from Perth Hydro, recently visited the new ship towing tank being built in Ostend, Belgium. The towing tank is 174 m long and 20 m wide, with water depths up to 1.0 m, and will arguably be the world's leading shallow-water model-testing facility. Above the concrete floor will be a rubber thermal expansion layer and composite floor designed to a tolerance of less than 1 mm over the entire length. Curvature of the earth was included in the design.

Below the tank is a reservoir with the same capacity as the towing tank, so that water can be easily transferred to change the water depth.

In a nice Australian connection, the conference room at the centre will be named the "Tuck Conference Room", to honour the contributions made to shallow-water ship hydrodynamics by Prof. Ernie Tuck of the University of Adelaide, from the 1960s to the 2000s.

Tim Gourlay

The new shallow-water towing tank in Ostend,
with composite tank floor, carriage and wave-maker to come
(Photo courtesy Tim Gourlay)

Prof. Evert Lataire, from Ghent University and Flanders Hydraulics Research,
explains the design of the new towing tank
(Photo courtesy Tim Gourlay)

Asset Management at ASC

ASC Life-cycle Engineer Sammar Abbas is applying the Asset Management approach to highly-complex defence assets, including the Collins-class submarine fleet. ASC is Australia's first defence company to achieve international Asset Management accreditation for a military platform under ISO 55001, which was achieved in May 2018. This means that ASC designs submarine sustainment operations for each of the six Collins-class submarines, taking into account their entire service life, extending well into the 2030s and including upgrades and life-extensions.

Sammar, who works at ASC's Western Australian submarine operations in Henderson, south of Perth, is also Chair of the Western Australian Section of the Royal Institution of Naval Architects.

Sammar Abbas
(Photo courtesy Tim Gourlay)

New Release of DNV GL's Nauticus Hull

DNV GL has announced the April 2019 (v20.8) release of their Nauticus Hull software. The new version includes the following main improvements:

Section Scantlings

- Colour coded nodes in the results tree, giving overall status of all requirements.
- Option to run calculations of a cross-section at multiple X-positions within the same compartments.
- Plate thickness direction relative to moulded line added to plate properties.
- Update cross section of outer shell panel by re-intersecting the 3D hull form (in case of changes to the hull form, or re-use cross section at other position).
- Increase maximum number of cross-section in memory, based on physical memory on computer.
- Option to control content of report from cross-section analysis.
- Open Windows Explorer on report folder from ribbon menu.

FE Template

- DNV GL rules: Standard FE loads for LPG carriers updated according to latest class guideline (CG 0133).
- Export of loads to Patran session file (limited to external sea pressures, green sea loads and internal liquid loads).

Tools

- Single beam spreadsheet converted to new format. Rules for PSM implemented.
- Spreadsheet for ships with L<=90m. Added use of frame numbers, delete last column, and save as standalone spreadsheet.

Other

- Import POSEIDON .hmx file.
- NAPA script to create compartment data .csv file updated to cover left-handed symmetry of NAPA models (available in User Manual).

For more information, please refer to the Release document which can be downloaded from DNV GL's Customer Portal. Please note that this has been revised (above link: Rev.1), whereas the original (Rev.0) is included in the software installation file.

Nauticus Hull "Classic" has not been updated as part of the January 2019 release. The official version of Nauticus Hull "classic" is January 2018 (version 18.15).

The software and documentation, including installation guide, user manuals and quick guides, are available from the DNV GL's Customer Portal. The portal is accessible for customers with a valid Service Level Agreement. First time users of the portal must register.

For installation or license issues, please contact Software Support at software.support@dnvgl.com

Vebjørn J. Guttormsen
Head of Section, Product Management & Support Class Development
DNV GL — Maritime

LR Approves Innovative LNG-fuelled VLCC With Rotor-sail Solution

LR has presented Samsung Heavy Industries with approval in principle (AiP) for an LNG-fuelled Very Large Crude Carrier (VLCC) equipped with a 6000 m^3 LNG fuel storage tank, a two-stroke dual-fuel diesel engine and an LNG fuel supply system. This AiP was a result of joint development project with SHI named VLCC2020.

LR assessed the technical feasibility of the LNG fuel-supply system and energy-saving technologies, including SAVER Air, an SHI patented air-lubrication system, and Norsepower's rotor-sail solution, a proven fuel-saving technology which offers potential fuel savings of 5–7%, depending on operating routes. SHI's LNG-fuelled VLCC design is estimated to reduce approximately 25% of CO_2 emissions and 99% of sulphur oxides, compared to conventional VLCC designs.

Mr JT Jung, SHI's CTO, said "This is a significant milestone for SHI and demonstrates our commitment in taking a step forward to help meet the challenge of reducing greenhouse gas emissions through a technically and commercially viable design."

Norsepower's CSO, Jukka Kuuskoski, said "We are excited to be collaborating with SHI and Lloyd's Register on this project. We are optimistic that support from these industry-leading organisations will open up the market for our rotor-sail technology to a larger number of VLCCs and similar ships."

Thomas Aschert, LR's North Europe Area Manager for Marine & Offshore, commented "We are proud to work with SHI on a such a future-focused LNG-fuelled VLCC design, and this AiP demonstrates SHI and Norsepower's commitment to supporting the shipping industry to reduce GHG emissions ahead of the IMO's 2050 deadline."

LR News, 6 June 2019

Common Structural Rules Software Updated

Common Structural Rules Software LLC, a joint venture company formed by LR and ABS, has released updates to its software products to simplify compliance with existing and future IACS Common Structural Rules (CSR). Both LR and ABS will use these tools to evaluate new designs against the CSR. The software provides users with an easy way to evaluate designs. It has recently been cross-checked by IACS and both software products, CSR Prescriptive Analysis and CSR Finite Element (FE) Analysis, demonstrated very high accuracy for calculations against comparable software.

Nick Brown, LR's Marine and Offshore Director, commented "By working together, LR and ABS have continued to improve our Common Structural Rules Software to ensure

that we provide the best tools for the industry to use when applying Common Structural Rules. The high accuracy of the software's calculations in the recent IACS cross-check results demonstrates that CSRS should be considered the benchmark in its field."

"We are living in a time of rapid change in the marine and offshore industries. So, as regulations evolve and requirements change, it is imperative for classification societies to provide services and solutions which keep pace," says Patrick Ryan, ABS Senior Vice-President, Engineering and Technology. "These enhancements to the CSRS products ensure that our tools remain effective and provide the best possible guidance to our clients, and to the public interest by extension."

CSR Prescriptive Analysis and CSR FE Analysis have both been updated to reflect new rule changes which will come into force on 1 July 2019. To improve reliability in assessment, CSR Prescriptive Analysis has newly-implemented swash-bulkhead calculations and enhanced the primary support-members calculations with new modelling function for openings.

The software is now employed by over 600 users. Regular updates for additional structural coverage and functionality will address ongoing CSR changes.

Detailed information on structural areas and functionality covered by this release are found in the Release Notes and User Guide bundled with the software installation. The updated CSR Prescriptive Analysis and CSR FE Analysis are available for download from the Common Structural Rules Software LLC website at www.commonstructuralrulessoftware.com.

LR News, 1 July 2019

A Royal Australian Navy light landing craft transports an Australian Army M1A1 Abrams main battle tank as part of load trials onboard HMAS *Canberra*, near Cowley Beach, Queensland (RAN photograph)

THE AUSTRALIAN NAVAL ARCHITECT

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

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

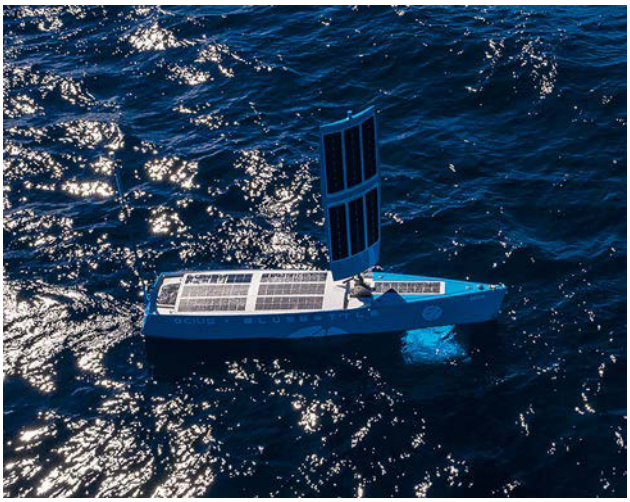
Photographs and figures should be sent as separate files (not embedded) with a minimum resolution of 200 dpi. A resolution of 300 dpi is preferred.

Ocius' *Bob* Sea Trials

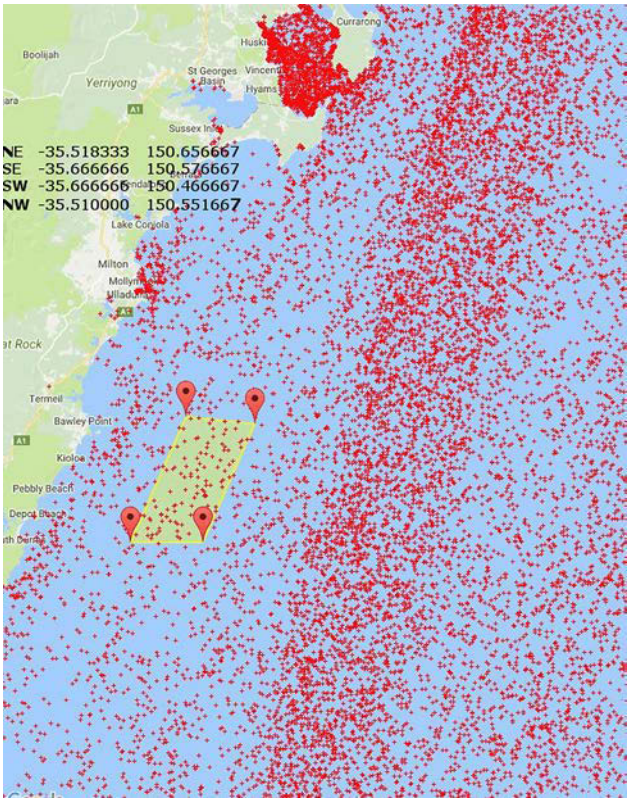
On Tuesday 26 March, the second vessel of Ocius Technology's Bruce-class Bluebottles, christened *Bob*, [*see* The ANA, *February 2019*—Ed.] underwent initial sea trials on Botany Bay. Design changes to *Bob*'s trim, displacement and helm immediately showed improvements in the vessel's performance.

Also, particularly pleasing was that algorithms and software functions, developed and optimised over two years on the original *Bruce,* copied seamlessly into *Bob*; for example, waypoint sailing, auto tacking upwind, figure-of-eight and station-holding, etc., all operated flawlessly and autonomously.

On 8 May *Bob* commenced open-ocean trials off Ulladulla in a 50 n mile^2 'box' approved by the Australian Maritime Safety Authority, Transport NSW and local fisherman for the testing of unmanned systems.



Bob on trials off Ulladulla in sail-only mode
(Photo courtesy Ocius Technology)



Vessel Traffic from AMSA Craft Tracking System
January—September 2017
(Image from Ocius Technology website)

In the vessel traffic diagram, red dots represent shipping density over six months, with the high density of dots at the top left being in Jervis Bay.

There is a link to a UAV video of *Bob* live off the NSW coast at https://ocius.com.au/blog/prototype-bob-begins-sea-trials-off-nsw-coast/

This area of ocean is well known for the East Australia Current (EAC), which *Bob* found running at 1–2 kn from NE

to SW. If transiting to a destination, then *Bob* could exit the current or use the current but this mission, requiring staying in the box, made it actually harder as the entire body of water was moving relentlessly south. If *Bob* couldn't navigate, then he'd be swept out of the bottom of the box in 6–10 hours!

By the end of a week, as the team revised, uploaded and tested new algorithms for certain headings and conditions, *Bob* was sailing and tacking brilliantly and, combined with wave and solar power, was able to navigate freely in the box sustainably—even signing his artwork!

These initial trials provided Ocius with enormous quantities of data to analyse and the intention is to upgrade their other USV, *Bruce,* to *Bob'*s specifications.

Trials continued in early-mid June, with Ocius running scenarios off the NSW Coast to test 'team behaviours' and 'intelligent networking'. In the first scenario, *Bob* and *Bruce* were joined by three simulated Bluebottle USVs to demonstrate how a team of five Bluebottles can patrol and guard an asset in the ocean. Ulladulla Marine Rescue assisted by having one of their vessels act as a suspected illegal intruder driving at 12 kn in the vicinity of the patrolled area. When one team member, in this case *Bruce*, detected the intruder he broadcasts his 'local view' to the 'team view' i.e. he shouted out to his teammates.

Another member of the team, in this case *Bob*, autonomously decided that he was the best positioned member of the team to go and 'investigate'. *Bob* then broadcast his intention to 'investigate' the suspicious vessel to his teammates and began moving to intercept the intruder. The other members of the team, on hearing *Bob*'s decision, began moving to continue covering the area left in *Bob*'s absence. Finally, the network raised an alarm to a 'human on the loop' at mission control. This all happened autonomously, without human intervention, and in less than a second.

Suspicious vessel in red, originally detected by *Bruce*, *Bob* going to investigate, others repositioning.
(Image courtesy Ocius Technology)

Bob moved to a position where he could obtain a good view of the intruder. He waited at a safe distance while the intruder passed, taking photos of the intruder so that it could be identified. The 'team view' is shared by all the members of the team and can be seen at mission control where the photos are assessed by a 'human on the loop' for further action.

Picture of the intruder taken from *Bob*'s mast camera, uploaded to 'human in the loop' at mission control..
(Photo courtesy Ocius Technology)

Tests continued in late June, with a final test demonstrating Ocius' visual acuity target-recognition and collision-avoidance software. In these scenarios, a Bluebottle was placed on a collision course with the Ocius support boat, a difficult-to-see low-to-the-water small rigid-hull inflatable boat. Using automatic visual recognition, the RHIB was identified as 'not water/not sky' and then positively identified as a 'speedboat'. This all happened autonomously, such that if the Bluebottle did not have communications at the time, it would avoid the collision and, when communications came back, it would send photos and GPS to the rest of the team and to the 'human on the loop'.

Most of the endurance and intelligent networking trials over the trials were done in Beaufort 1–4 conditions. However, in mid-June, they had the opportunity to test the sailing and rudder flipper in Beaufort 5–6 southerly winds and 1 kn northerly current for 24 hours. They were able to navigate freely in both sail-only mode—at one point going up to 5 kn boat speed—and in rudder-flipper-only mode at up to 2 kn boat speed, with both modes using zero propeller power.

These trials complete all of Ocius' sea-trial requirements under their Defence Innovation Hub contract, three months ahead of schedule.

Robert Dane
Ocius Technology

WWSR Spirit II

Dave Warby's attempt to break his father Ken's World Water Speed Record in *Spirit of Australia II* progressed when the team returned to Blowering Dam for further trials on the Mothers' Day weekend in May. Dave put down a run of 221 mph (356 km/h), followed by a sustained run of 230 mph (370 km/h) and a maximum speed of 235 mph (378 km/h).

A routine inspection of the Orpheus 803 jet engine following the trials revealed that the turbine disc (the last fan wheel) was not giving of its best. The team swapped the spare engine over into the boat, and then scratched their heads over where they would get a replacement turbine disc for an engine which went out of production many years ago. They finally found one within a sectioned engine owned by the North East Aircraft Museum in Sunderland, UK, and the museum is willing to swap turbine discs!

The team had *Spirit II* on display at the Sydney International Boat Show at Darling Harbour from 1–5 August, and are due

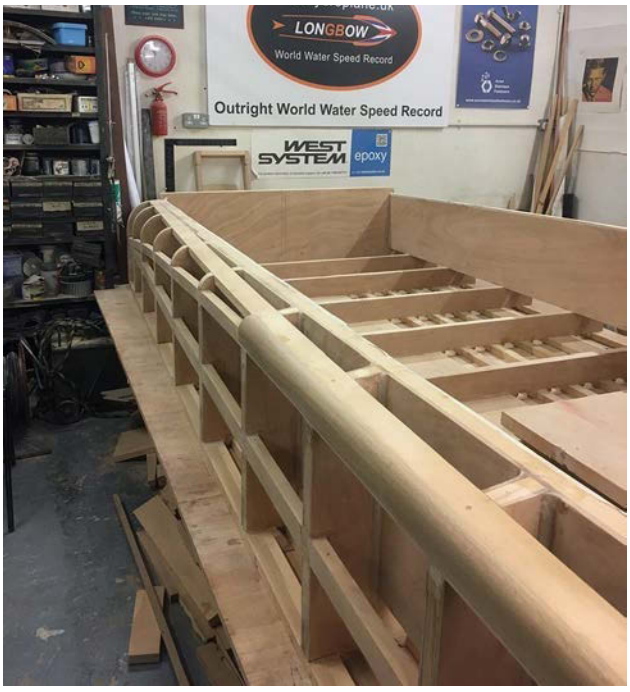
Spirit 2 on Blowering Dam
(Photo from Warby Motorsport Facebook page)

to return to Blowering Dam in late August/early September as they push the speed towards the current world record of 511 km/h.

WWSR Longbow

Britain has re-entered the contest for the World Water Speed Record with a new vessel, *Longbow*, having commenced construction in April 2018.

The hull commenced construction upside-down, and was turned over in late May to enable fitting of the top outer rails of the hull and form the structure and curve the frames for the barrel-back shape of the hull topsides.



Construction of *Longbow*'s hull topsides proceeding
(Photo from Longbow website)

The next job is to turn the hull back upside-down to enable skinning the underside of the hull. As it will be a while before she is the right way up again, the team took the opportunity to put the driver capsule back into the hull along with one of the pair of Viper 535 jet engines, for a trial fit.

Trial fit of *Longbow*'s driver capsule and one jet engine
(Photo from Longbow website)

Work is proceeding on the Rolls-Royce Viper turbojet engines and instrumentation, and discussions have commenced with the Lakes District National Park Authority re using Coniston Water for their testing and record attempts.

[*For monthly updates and photos, see the Longbow website at https://www.jet-hydroplane.uk/news/* — Ed.]

Longbow website

Team Britannia

Team Britannia is a multi-million-pound British bid led by ocean adventurer, Alan Priddy, to design and build *Excalibur,* the fastest and most fuel-efficient wave-slicing powerboat to circumnavigate the globe for the much-coveted Union Internationale Motonautique world record, currently held by New Zealander Pete Bethune at 60 days 23 h 49 min in *Earthrace*.

Construction has progressed, with the inside of the wheelhouse having been finished and fit-out commencing. The two enormous Castoldi jet drives have been test fitted to the stern of the vessel, but will be removed for the transom to be inserted.

Castoldi jets test fitted to *Team Britannia*
(Photo from Team Britannia Facebook page)

Global Ocean Challenge

Global Ocean Challenge (GOC) is a recent entry in the attempt to circumnavigate the globe for the much-coveted Union Internationale Motonautique (UIM) world record, currently held by New Zealander Pete Bethune at 60 days 23 h 49 min in *Earthrace*.

Their vessel, *Ocean Gladiator*, has been developed combining the vast experience of the crew in conjunction with naval architects to achieve an advanced high-speed displacement catamaran hullform powered by quad outboard motors. The vessel will be crewed by brothers Mark Smith (skipper), John Smith (engineer) and Andrew Smith (navigator and throttles).

Principal particulars of *Ocean Gladiator* are

Length OA		24 m
Beam		8 m
Displacement		7 t
Fuel		30 000 L
Power		1193 kW
Speed	(cruising)	30 kn
	(maximum)	50 kn
Range		4000 n miles

To complete the record the vessel must pass through the Suez and Panama Canals and start and finish in the same place. The UIM has approved GOC's proposed route, which starts in Singapore and will call at the Maldives, Djibouti, Port Said, Gibraltar, Azores, Puerto Rico, Panama, Acapulco, Hawaii, Marshall Islands and Guam, covering approximately 23 000 n miles.

No schedule for construction or the attempt appear to have been set.

Further details can be found on the GOC website, https://www,globaloceanchallenge.com.au/

First impression of *Ocean Gladiator*
(Image from GOC website)

The Dupree Cup

The Dupree Cup is believed to have been donated to the Royal Naval Club and Royal Albert Yacht Club of Portsmouth, UK, in the 1920s by the local brewing magnate, Sir William Dupree. It was awarded to winners of the Portsmouth and Southsea Powerboat Race but, on the outbreak of World War II, the Club Secretary, fearing a Nazi invasion, took it upon himself to hide the cup along with some other valuables. Unfortunately, he died before the end of the war without revealing where they were. Fast forward to the 1980s, and builders renovating the Queen's Hotel in Southsea discovered the cup and other items hidden in a chimney breast.

Despite having sustained some damage, the cup went on display back at the club until last year. Then, thanks to a generous donation from Team Britannia, the cup was fully restored to its former glory. It is believed that the Dupree Cup is now the second-oldest power-boating trophy still in use, the oldest being the International Harmsworth Trophy, first presented in 1903 by Sir Alfred Harmsworth, former proprietor of the Daily Mail. In fact, while the inscription on the Dupree Cup bears the date 1931, deciphering its silver hallmark reveals that it could actually date back to 1913!

The cup was re-dedicated in a ceremony at the Royal Naval Club and Royal Albert Yacht Club on 31 May 2019 as the Dupree International Challenge Trophy, to be awarded to the holder of the UIM-certified fastest circumnavigation of the world by a powerboat.

Phil Helmore

The Dupree International Challenge Trophy
(Photo from Clive Tully's blog)

Incat to build the World's Largest Aluminium Ship

On 20 May Incat announced that it had secured a contract to build the world's largest aluminium ship.

Incat Tasmania Pty Ltd will build the 130 m vessel for long-standing customer, Buquebus, to operate between Argentina and Uruguay.

The completed vessel will be the largest aluminium ferry ever built and the ninth vessel for Incat's valued South American customer.

The 130 m ferry will join the other Incat ships already serving various ports on the River Plate between Argentina and Uruguay.

At a probable 13 000 GRT the 130 m long, 32 m wide vessel will carry 2100 passengers and 220 cars. The duty-free shop will be world's largest fitted on a ship, with over 3000 m^2 of retail floor space, similar in size to a large airport duty-free shop.

Work is underway on design and engineering, and construction will commence as soon as the detail design drawings are completed and approved by the customer.

The new Buquebus ship, Incat hull 096, is predicted to have a maximum speed of over 40 kn. The ship will be powered by four dual-fuel engines which will burn environmentally-friendly LNG while in service between Argentina and Uruguay.

Incat shipyard currently has confirmed orders covering the next four years with high expectations of other large vessel orders. The workforce, now totalling over 600, will be expanded to facilitate the construction of the new vessels in Incat's very healthy order book.

The 130 m ferry to be built by Incat Tasmania for Buquebus
(Image courtesy Incat Tasmania)

Austal Delivers Third Guardian-class Patrol Boat

Austal delivered the third Guardian-class Patrol Boat (GCPB) to the Australian Department of Defence on 24 June. In a handover ceremony with the Crown Prince of Tonga, His Royal Highness, Prince Tupouto'a 'Ulukalala, the Commonwealth, represented by Assistant Minister for Defence, the Hon. Alex Hawke MP, gifted the vessel to the Government of Tonga.

"This is the third of 21 Guardian-class patrol boats which Austal has designed and built for the Commonwealth's Pacific Maritime Security Program. We are very proud to be delivering this program which will continue out to 2023" David Singleton, Austal's Chief Executive Officer, said.

"These vessels will have ongoing maintenance support from our service centre operations in Cairns, ensuring continued engagement and opportunities for Austal in the Pacific. This has been an important program being Austal's first major steel shipbuilding program and sustainment operation" he said.

"The Guardian class provides a very modern and capable patrol boat matched to the south-east Asian and Indo-Pacific region. It is a very affordable vessel and is a focus for our export activities" he said.

The Pacific Patrol Boat Replacement Program was awarded to Austal in May 2016, with an additional contract option awarded in April 2018 taking the program to 21 vessels valued at more than $335 million. The program supports more than 200 direct jobs at Austal, and more than a further 200 indirect jobs through the Australian industry involved in the program. In total Austal has more than 1000 employees in Australia directly contributing to and delivering a strong domestic and export shipbuilding order book.

Crown Prince Tupouto'a 'Ulukalala of the Kingdom of Tonga with the Assistant Minister for Defence and Minister for International Development and the Pacific, the Hon. Alex Hawke MP, and Minister for Defence Industry, the Hon. Melissa Price MP, at Austal for the gifting of the GCPB *Ngahau Koula*
(Photo courtesy Austal)

At-sea Repair for LNG Tanker

In May Civmec successfully completed marine maintenance repairs on board a large vessel in open water, under extremely challenging conditions.

Civmec personnel battled large swells as they undertook the complex repairs of the LNG tanker *Gas Defiance*, 100 km off the New South Wales coast.

The emergency repairs, for the Greek company Stealth Maritime Industries, included rectification of major damage to the deck and Panama chock, essential for the guidance of rope mooring lines on board the large vessel.

Undertaken over six days, the repairs required hot work which, for safety reasons, the Port Authority of New South Wales would not allow to be undertaken while the tanker was at berth.

Civmec was able to quickly mobilise a specialised team to carry out the emergency repairs, including organising materials and equipment, undertaking the required non-destructive testing, and liaising with the Port Authority regarding access and permits.

Incat Tasmania Delivers New Ferry to Spain

Incat Tasmania's newest 111 m ferry has been handed over to her new Spanish operator, Naviera Armas, and departed Hobart late on 16 July for Spain.

Naviera Armas will operate the vessel on Spanish routes, including the Canary Islands. The company has an extensive fleet of vessels, and *Volcan de Tagoro* will be the fifth Incat vessel operating in the Armas fleet; however, it is their first newbuild from Incat Tasmania, having obtained their other Incat-built vessels on the second-hand market.

Volcan de Tagoro has capacity for 1200 persons, including crew, and the expansive vehicle deck allows for 595 TLM (truck lane metres) plus 219 cars, or in car-only mode it can accommodate 401 cars. Passenger spaces are divided into three classes, First, Business and Economy, with each area offering bars and food service. A gift shop and children's play area are also located on board.

The ship is powered by four MAN 20V diesel engines driving Wartsila waterjets. The ship achieved over 42 kn with 600 t deadweight during trials, easily achieving her contract speed and the loaded service speed required for the Spanish routes.

Incat CEO, Tim Burnell, said "Our team at Incat have been busy, and this is the second large vessel delivered in just six months. We have been building *Volcan de Tagoro* for two years, so it was great to see many staff show family members through the ship last week, clearly proud of their workmanship on the vessel. We are seeing an unprecedented level of interest in both large and small aluminium ferries at present, and have expectations of operating at maximum capacity for a number of years. The contract, worth in excess of $100 million to Incat, has also provided significant income to suppliers and sub-contractors".

Volcan de Tagoro ready for launching
(Photo by Kim Clifford, courtesy Incat Tasmania)

Volcan de Tagoro in the Derwent
(Photo by Karen Hannah, courtesy Incat Tasmania)

Incat's Prince of Wales Bay shipyard is continuing construction of three large vessels plus a 35 m commuter ferry, *Geelong Flyer*, which will operate between Geelong and Docklands in Melbourne from early December.

The next export vessel is a 100 m ship for Trinidad and Tobago to be completed in 2020, followed by another 111 m ship for a European operator in 2021.

General Particulars

Designer	Revolution Design
Class	DNV-GL ✠A1 HSLC R1 Ferry "B" EO
Length OA	111.9 m
LengthWL	103.2 m
Beam OA	30.5 m
Beam (hulls)	5.8 m
Draft	4.1 m
Speed	42.4 kn at 600 t deadweight

Capacities

Max. deadweight	1000 t (approx)
Complement	1200 persons (including crew)
Accommodation	8 crew including bunks, lockers and bathroom facilities
Vehicles	595 Truck lane metres @ 3.1 m (w) plus 219 cars @ 4.5 m x 2.35 m or 401 cars
Axle loads	13.0 t (single axle, dual wheel) on truck decks 2.0 t (single axle) elsewhere

Tankage

Fuel oil	160 000 L approx. (main storage)
MGO fuel oil	450 000 L approx. (long range)
Fuel oil	2 × 1240 L (header tanks)
Genset fuel oil	2 × 1240 L
Fresh water	2 × 5000 L
Sewage	2 × 6500 L
Lube oil	1 × 1100 L
Oily bilge	1 × 1100 L
ER sludge	4 × 160 L
Aft hydraulic oil	2 × 500 L
Fwd hydraulic oil	1 × 500 L

Air Conditioning

Reverse-cycle heat-pump units throughout capable of maintaining between 20–22° C and 50% RH with a full passenger load and ambient temperature of between 0° C and 35° C and 60 % RH.

Evacuation

Four marine evacuation stations (MES), two port and two starboard, each MES capable of serving a total of up to 300 persons. A total of fourteen 100-person liferafts are fitted.

2 × SOLAS semi-rigid inflatable dinghies with motor and approved launch/recovery method

Machinery

Main Engines	4 × MAN 28/33D STC 20V each 9100 kW at 100% MCR
Water Jets	4 × Wartsila Lips LJX 1500SR
Transmission	4 × ZF 60000 NR2H gearboxes.
Hydraulics	Three hydraulic power packs, one forward and two aft, all alarmed for low level, high temperature, filter clog and low pressure. One pressure-line filter and two return-line filters fitted. An off-line filter/pump provided

Ride Control A Naiad Dynamics active ride-control system is fitted to maximise passenger comfort. This system combines active trim tabs aft and a fold-down T-foil located at the aft end of the centre bow.

Electrical Installation

Alternators 4 × Scania DI13 074M, 323 kW

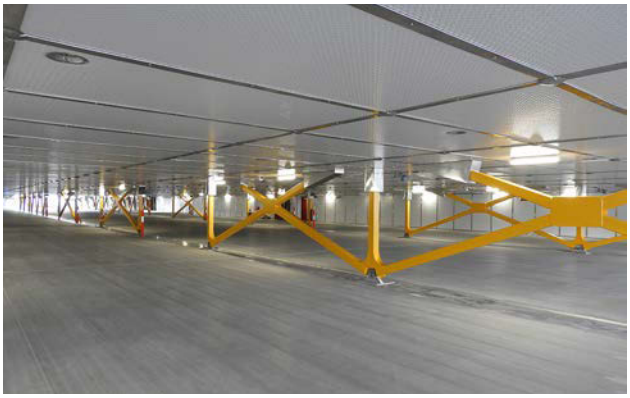
Distribution 415 V, 50 Hz. 3-phase 4-wire distribution with neutral earth allowing 240 volt supply using one phase and one neutral. Distribution via distribution boards adjacent to or within the space they serve. 200-amp 415 V 3-phase shore-power connection point fitted in starboard anteroom.

First-class seating in *Volcan de Tagoro*
(Photo courtesy Incat Tasmania)

Business-class seating in *Volcan de Tagoro*
(Photo courtesy Incat Tasmania)

First-class bar in *Volcan de Tagoro*
(Photo courtesy Incat Tasmania)

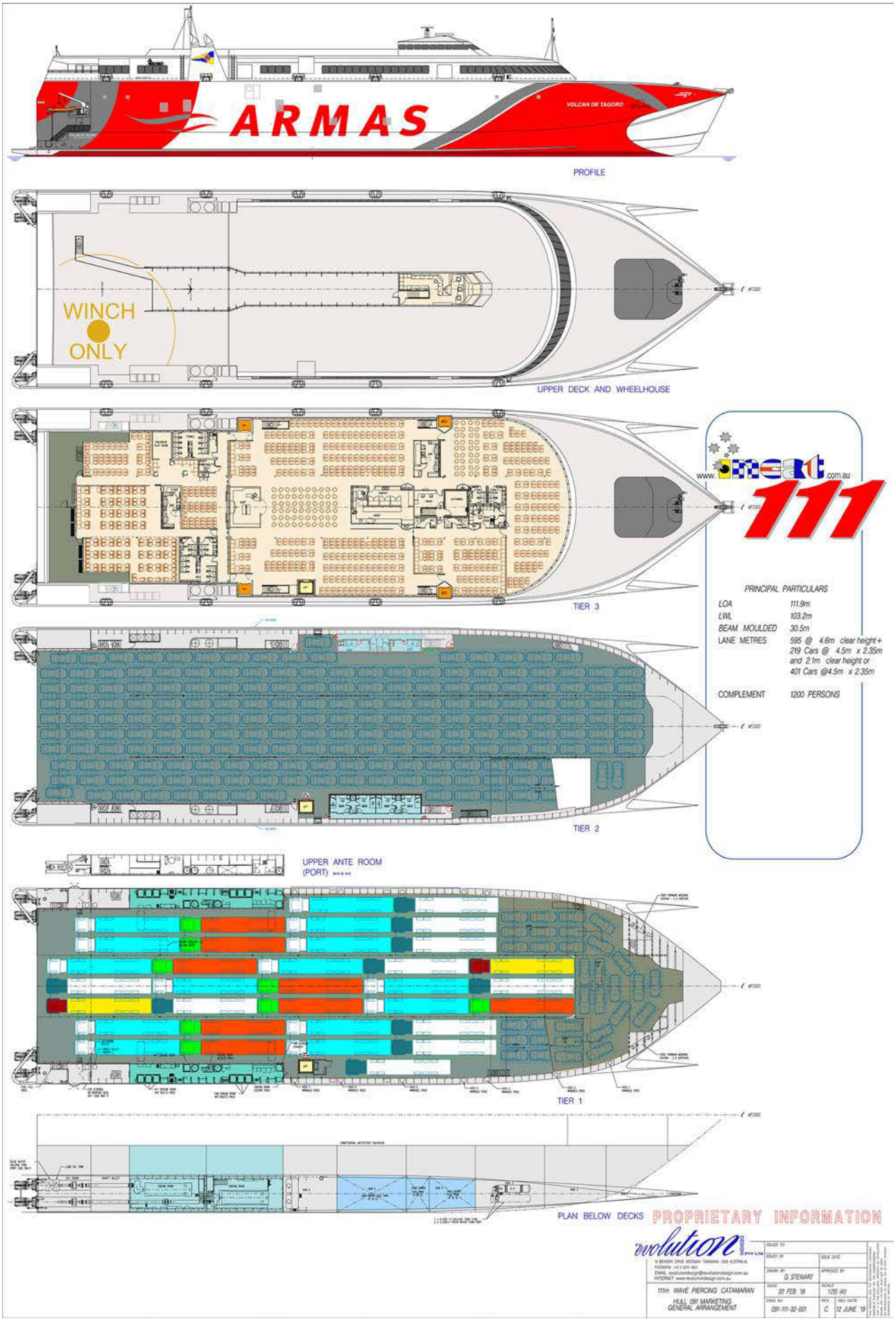
First-class seating in *Volcan de Tagoro*
(Photo courtesy Incat Tasmania)



Volcan de Tagoro vehicle deck
(Photo courtesy Incat Tasmania)

The bridge in *Volcan de Tagoro*
(Photo courtesy Incat Tasmania)

Volcan de Tagoro during sea trials
(Photo by Walter Pless, courtesy Incat Tasmania)



General Arrangement of *Volcan de Tagoro*
(Drawing courtesy Incat Tasmania)

Austal Delivers Passenger Ferry to SNC Aremiti

On 5 August Austal announced the successful delivery of a 49 m high-speed passenger ferry to SNC Aremiti. The $30 million project was awarded in late December 2017 and has been delivered by Austal's Philippines shipyard.

Austal's Chief Executive Officer, David Singleton, said that the high-quality vessel demonstrated the capabilities of the company's recently-expanded Philippines shipyard.

"Austal Philippines has done an excellent job on this project, producing a high-quality vessel for a long-standing client, which reflects the professional staff and shipbuilding skills we have at our Cebu shipyard," Mr Singleton said.

"Over the past 12 months we have completed a major expansion at the yard to more than treble its capacity, with well over 900 employees now working at Austal Philippines.

"At last week's opening of the centrepiece of this expansion, the John Rothwell Assembly Bay, it was an honour to have this vessel on full display to Philippines Government officials. Austal Philippines is now delivering some of the world's most technologically advanced and sophisticated vessels."

Aremiti 6 is an Austal design which features seating capacity for 620 passengers and garage space for up to 30 motorbikes, small vehicles and cargo. With a top speed of 36 kn she will be fitted with Austal's ride control system to improve seakeeping and provide greater passenger comfort on the Papeete–Moorea route in French Polynesia. This is the fifth vessel which Austal has delivered to French Polynesia since 2002.

Austal Delivers LCS to US Navy

Austal USA delivered the tenth Independence-class Littoral Combat Ship (LCS) to the United States Navy in June. The future USS *Cincinnati* (LCS 20) will be the 18th LCS to join the US fleet.

"This program continues to improve in efficiency and is delivering a first rate capability for the US Navy. It is a credit to the hard-working and skilled team we have in Mobile, Alabama" Austal CEO, David Singleton, said.

Five small surface combatants are presently under various stages of construction at Austal's Alabama shipyard. *Kansas City* (LCS 22) is preparing for sea trials. *Oakland* (LCS 24) was launched on 21 July and assembly of *Mobile* (LCS 26) is underway. Modules are under construction for *Savannah*

Aremiti 6, recently delivered by Austal Phillipines
(Photo courtesy Austal)

(LCS 28) and *Canberra* (LCS 30), with four more under contract through to LCS 38.

Austal is also under contract to deliver 14 expeditionary fast transport vessels (EPF) for the US Navy. The company has delivered ten EPFs into service with an additional two in various stages of construction.

USS *Cincinnati* will be commissioned into the US Navy on 5 October
(Photo courtesy Austal)

The future USS *Oakland* was launched by Austal USA on 21 July
(Photo courtesy Austal)

French Submarine *Suffren* Afloat

The lead boat of the Barracuda-class of French Navy nuclear-powered attack submarines is now in the water after being officially launched on 12 July. The French Directorate General of Armament (DGA) announced that the boat entered the water on 1 August.

Built by the French shipbuilder, Naval Group, *Suffren* is the first of a new generation of French Navy boats built to replace the ageing Rubis-class submarines.

Suffren ready for her official launching ceremony on 12 July
(French Navy photograph)

Suffren afloat
(DGA photograph)

Suffren is one of six units in the class funded in 2006. Development of the Barracuda-class program started in 1998. *Suffren* is scheduled to start her first sea trials in early 2020.

France expects to commission all the Barracuda-class submarines — *Suffren, Duguay-Trouin*, *Tourville*, *Dupetit-Thouars*, *Duquesne* and *De Grass* — by 2030.

Milestone for Australia's New Icebreaker

RSV *Nuyina's* diesel generator sets were started up for the first time in late July.

The icebreaker's two main propulsion diesel engines (9.6 MW each) will drive two controllable pitch propellers in normal sailing conditions.

However, during scientific operations, when acoustic instruments are in use, these diesel engines can be de-clutched from the propeller shaftlines, and low-noise electric propulsion motors (3.7 MW each) can be used to drive the shafts.

For heavy icebreaking, *Nuyina* will use both diesel propulsion engines and both electric propulsion motors to drive the shafts, providing a maximum propulsion power of up to 26.6 MW.

It will also be possible to use the main propulsion diesel engines with the low-noise electric motors set in reverse, to generate electrical power from the shaftlines. This means that the ship's generators do not need to be operating to generate electrical power for the vessel's day-to-day living requirements,

Coming to life — the diesel generators in *Nuyina*
(Photo courtesy AAD)

HMAS *Newcastle* departing Newcastle on 21 June after a final visit to her namesake port
(RAN photograph)

HMAS *Success* arriving at her base at Garden Island for the last time on 16 June and flying a very long paying-off pennant
(RAN photograph)

HMAS *Newcastle* Decommissioned

The Royal Australian Navy has celebrated the completion of 25 years of service by HMAS *Newcastle* at a ceremony to decommission the ship at her home port of Garden Island in Sydney on 30 June.

Since commissioning in 1993, *Newcastle* had steamed around 815,000 n miles, deployed on operations to the Middle East six times; earned battle honours for her service in East Timor, the Persian Gulf and the Middle East; and conducted peacekeeping operations in the Solomon Islands.

Newcastle also undertook a number of humanitarian operations, including rescuing two injured yachtsman from *Solo Global Challenger* in the tragic 1998 Sydney–Hobart yacht race and rescuing the crew of Ocean Rowing Boat *Transventure* in 2003.

The Minister for Defence, Senator the Hon. Linda Reynolds CSC, said that *Newcastle* had been essential in protecting Australia's maritime interests.

"HMAS *Newcastle* has served the Royal Australian Navy with distinction for over quarter of a century," Minister Reynolds said.

"I pay tribute to the ship's company whose service on *Newcastle* over the years has contributed to security at sea, at home and abroad."

The Chief of Navy, VADM Michael Noonan AO, RAN said that the ship's company were honoured to be the last crew to serve in *Newcastle* and was pleased that the occasion could be shared with many former ship's company, who attended the decommissioning ceremony.

"For those who served in *Newcastle* she was not just their workplace, she was their home away from home and they can look back on their time on board with pride," Vice Admiral Noonan said.

"The 5000 men and women who served in this ship achieved great things and, for some, *Newcastle* represents key milestones in their lives and their careers."

HMAS *Newcastle* is being decommissioned to make way for the Hobart-class guided-missile destroyers. Newcastle was built in Australia at Williamstown, Victoria. She was the last of the RAN's six guided missile frigates (FFG) to be commissioned. HMAS *Melbourne*, also built at Williamstown, will be decommissioned on 26 October 2019.

HMAS *Newcastle* was decommissioned at Fleet Base East on 30 June 2019
(RAN photograph)

HMAS *Success* Decommissioned

The Royal Australian Navy has decommissioned HMAS *Success* at her home port of Garden Island in Sydney, in a ceremony full of tradition, after more than three decades of service.

The Chief of Navy, VADM Michael Noonan AO, RAN, joined 23rd and final Commanding Officer of HMAS *Success*, CAPT Darren Grogan, to pay tribute to the 'First Lady of the Fleet', a title given to Navy's oldest ship, and the 5000 men and women who served in her.

"HMAS *Success* has built a proud history and served Australia with distinction by contributing to many of Navy's most important operations over the past three decades," VADM Noonan said.

Commissioned in 1986, HMAS *Success* had steamed almost one million nautical miles, undertook over 3500 replenishments, participated in a world record 11 Rim of the Pacific exercises, earned battle honours for service during the 1991 Gulf War and in East Timor in 1999, and helped search for missing Malaysian Airlines Flight 370.

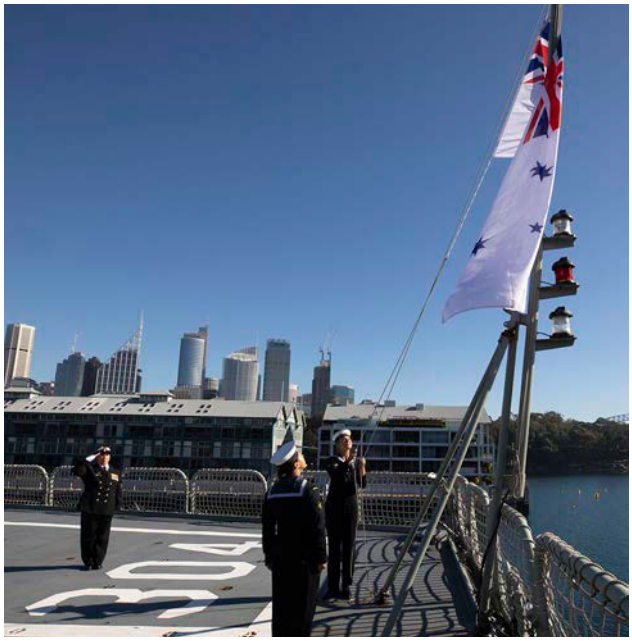
The vessel was built at Cockatoo Island, and *Success* won the RAN's prestigious Duke of Gloucester's Cup, awarded to the RAN unit displaying the highest level of overall proficiency, on three occasions; 1990, 1999 and 2014.

The Assistant Defence Minister, the Hon. Alex Hawke MP, said that lowering the ship's Australian White Ensign for the final time closed a significant chapter in Navy's history.

"*Success* will be missed. She has been such an integral part of Navy over the past 33 years that many sailors and officers will not know the fleet without her," he said.

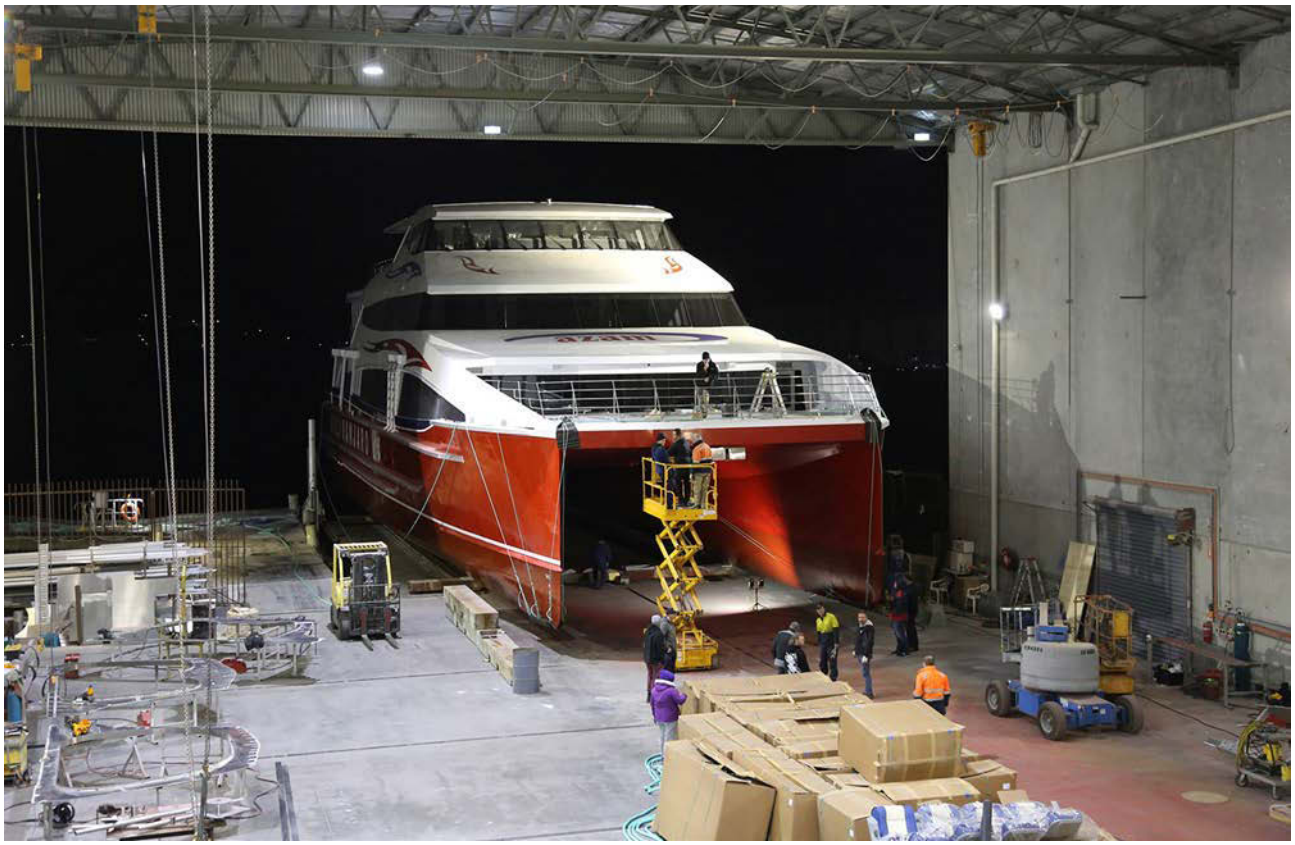
"This bittersweet feeling can be tempered by the knowledge that so many who served in *Success* are proud of her achievements on behalf of Navy and Australia."

HMAS *Success* was decommissioned to make way for a replenishment ship, the future HMAS *Supply*, which will commence service in 2020.



The White Ensign is lowered on board HMAS *Success* for the last time on 30 June
(RAN photograph)

Gleaming with new paint, NUSHIP *Sydney* was undocked recently after final preparations for her sea trials later this year
(Photo courtesy AWD Alliance)



Kilimanjaro VII, a 45 m passenger ferry for operations from Dar es Salaam, Tanzania, to the island of Zanzibar was launched by Richardson Devine Marine Constructions in Tasmania on 18 June 2019
(Photo courtesy RDM)

Shadow Cat *Hodor* from Incat Crowther

Hodor is the first in the shadow-cat range which brings Incat Crowther's catamaran capability to the yacht industry. The platform offers large amounts of deck and storage space, flexibility, stability, efficiency and capability. The design offers a stable platform for the safe arrival of guests by helicopter and transfer to the mothership via tenders.

Design and naval architecture was by Incat Crowther, project management and technical consultation by Robert Smith of YCTS, and construction by Astilleros Armón at their Burela shipyard in Spain.

Hodor has been completely customised to carry the specific equipment and supplies to support and enhance the owner's mothership capabilities. The design uses the robust engineering of hulls proven in offshore platform service, such as the SEACOR CREWzer class and Incat Crowther's 70 m fast crew-boat class. The hull incorporates a reverse bow, a deadweight capacity of 240 t and a low propeller draft of 3.1 m.

The platform accommodates a huge number of toys, facilities and personnel. This includes five tenders (from 7 m to 17 m in length), four jet skis, four quad bikes, and an Aurora-5 submarine with its own garage, a helipad, a large complement of crew, staff and support equipment.

The tenders and submarine are flexibly located and can be launched from the upper or main deck (on the upper deck via the two large knuckle-boom cranes, and on the main deck via twin beam cranes) and, the main feature of the vessel, the aft lifting platform for the 17 m chase boat. A portable davit on the foredeck facilitates the launch and recovery of the vessel's ROV, and it can also be used for additional jet ski storage.

The helipad is a fully-certified and CAP437 compliant for helicopters of 6 t and up to D-value of 16 m, including the Eurocopter EC145. A large reception room, finished to a yacht standard, sits forward of the helipad, allowing guests to be transferred in comfort between helicopters and tenders.

The port hull shell door, provided for guest access, is finished to a yacht standard and directly connected to the guest lounge via a guest staircase. The starboard hull shell door is reserved for crew operations. There is also water access via two stern platforms, should weather conditions require stern boarding.

Dive equipment is fully integrated with compressors, NitrOx and O_2 facilities, as well as a hospital with decompression chamber.

Specialised spaces are dedicated for fresh and frozen food storage, additional storage for the mother vessel, waste treatment, and general and spares stores.

Propulsion is provided by two MTU 16V 4000 main engines, giving a maximum speed of 22.5 kn, or long-range cruising at 14 kn up to 5500 n miles. The catamaran platform allows fuel savings of around 40%, affording the full vessel range with only 160 000 L of diesel fuel. The vessel's tankage supplies toys and vehicles with jet fuel, petrol and diesel from dedicated bunker stations.

A complement of 20 crew and staff are comfortably accommodated in 7 twin and 3 double ILO-compliant staterooms, each with ensuite bathrooms. Other spaces on board include crew recreation areas, mess, lounge, support facilities, galley, servery, laundry, medical room, workshop, and captain's office. Spaces specifically for the owner include the owner's lounge on the upper deck and the port hull shell beach deck with twin day heads.

Port bow view of *Hodor*
(Photo courtesy Clint Jenkins Photography)

Crew recreation area on *Hodor*
(Photo courtesy Clint Jenkins Photography)

Decompression chamber on *Hodor*
(Photo courtesy Clint Jenkins Photography)

Double cabin on *Hodor*
(Photo courtesy Clint Jenkins Photography)

Galley on *Hodor*
(Photo courtesy Clint Jenkins Photography)

The wheelhouse is situated to give excellent all-round visibility. Access to electronics systems is simplified with incorporation of a walk-around main helm console and a dedicated MEC.

Fitted with an exhaust cleaning SCR system for IMO Tier 3 and EPA Tier 4 compliance, greenhouse gas emissions are significantly reduced, allowing the Incat Crowther 66 design to be environmentally friendly.

The inherent stability of the catamaran does not require gyro or roll stabilizers whilst at rest. When underway, the vessel pitching motions are reduced by twin Humphree active interceptors on the stern. A twin anchoring system is provided which, combined with the widely-spaced twin hulls, provides reduced motions whilst at anchor.

Patton Marine have inspected the vessel, and marine surveyor Tom Corness explains “The quality of workmanship is exceptional for this commercial standard of vessel—it blends commercial and yacht standards perfectly to perform yacht-support tasks”.

Incat Crowther, together with YCTS, is offering a new range of shadow cats which is set to bring a new level of capability to yacht owners and operators, with unparalleled support-vessel capacity, stability and flexibility. The design is fully customizable to suit each owner’s requirements, including further features, such as a helicopter hangar, available on request.

Helipad on *Hodor*
(Photo courtesy Clint Jenkins Photography)

Port hull beach deck on *Hodor*
(Photo courtesy Clint Jenkins Photography)

Principal particulars of *Hodor* are

Length OA		66.2 m
Length WL		64.8 m
Beam OA		14.0 m
Depth		5.45 m
Draft	(hull)	2.30 m
	(propellers)	3.10 m
Tonnage		1525 GT
Personnel		20
Fuel oil		160 000 L
Urea		12 800 L
Jet fuel		7600 L
Petrol		7600 L
Fresh water		20 000 L
Grey water		16 750 L
Black water		3200 L
Main engines		2×MTU 16V 4000 M73L SCR each 2880 kW @ 2050rpm
Propulsion		2×Servogear controllable-pitch propellers
Generators		2×CAT C9.3
Speed	(service)	21 kn
	(maximum)	22.5 kn
Range		5500 n miles @ 14 kn
Construction		Marine-grade aluminium
Flag		Cayman Islands
Class/Survey		Lloyds Register ✠100A1 SSC Support Catamaran HSCV G6, LMC, Helicopter Landing Area, UMS

Toy garage on *Hodor*
(Photo courtesy Clint Jenkins Photography)

Upper deck on *Hodor*
(Photo courtesy Clint Jenkins Photography)

Dolphin 3 from Incat Crowther

Incat Crowther has announced a contract to design a 65 m catamaran passenger ferry for operation in Korea. The Incat Crowther 65 will be built by Khan Co. of Geoje-si, Korea, and operated by Dolphin Shipping Co.

The vessel will provide a vital link between Pohang (on mainland Korea) and the island of Ulleung-do, where it will be the second-largest vessel on the route. It will be the first locally-built high-speed ferry on the route.

Khan is a respected, established name in Korea's shipbuilding industry. Incat Crowther will work with Khan to develop the construction capability for aluminium high-speed vessels, in compliance with the IMO HSC Code and local Korean Register of Shipping (KRS) regulations. This "technology transfer" is a key feature of Incat Crowther's design service, and allows builders to benefit from world-leading industry expertise.

Tentatively named *Dolphin 3*, the vessel will carry 710 passengers on two decks, with the wheelhouse located on a third deck with all-round visibility. Oversize boarding points are located aft and amidships to facilitate smooth boarding of the large passenger complement. There are multiple wheelchair spaces on the main deck, as well as a kiosk. There are also ample luggage racks, as well as a crew accommodation module aft. The upper deck features a pair of 4-person VIP rooms port and starboard, fitted with first-class seating and excellent exterior visibility.

Due to its size and excellent seakeeping characteristics, the Incat Crowther 65 will be more capable in rougher seas than existing boats on the run, dramatically increasing the number of days per year on which the service is run.

As a vital transport connection to Ulleung-do, Dolphin Shipping is planning to offer a new level of speed and comfort, with luxurious seats, ample amenities and on-board wi-fi connection. The vessel will take an hour off the operator's current vessel journey. It is anticipated that the improved speed, comfort and operability will make a substantial difference to the lives of island residents and the journey of visiting tourists.

Dolphin 3 will be powered by quad 3700 kW main engines driving Rolls-Royce KaMeWa S80-4 waterjets. The vessel will operate at 39.5 kn.

Dolphin 3 will be a demonstration of Incat Crowther's expertise in bringing world-leading technology to new markets.

Starboard bow of *Dolphin 3*
(Image courtesy Incat Crowther)

Principal particulars of *Dolphin* 3 are

Length OA	64.5 m
Length WL	62.1 m
Beam OA	14.0 m
Depth	5.00 m
Draft (hull)	1.70 m
Passengers	710
Crew	12
Fuel oil	30 000 L
Fresh water	5000 L
Sullage	3000 L
Main engines	4×diesel engines each 3700 kW @ 1900 rpm
Waterjets	4×Rolls-Royce KaMeWa S80-4
Speed (service)	39.5 kn
(maximum)	47 kn
Construction	Marine-grade aluminium
Flag	Republic of Korea
Class/Survey	KRS ✠KRS0 Passenger Ship Catamaran (HSLC-SA2) ✠KRM0 UMA

Spirit of Migaloo II from Incat Crowther

Incat Crowther has announced the delivery of *Spirit of Migaloo II*, a 24 m catamaran whale-watch vessel, built by Aluminium Marine in Queensland, to be operated by Seaworld Cruises.

Drawing on the latest Auminium Marine-built Incat Crowther-designed vessels, *Spirit of Migaloo II* is specifically configured for optimum viewing during whale-watching trips, with an amazing onboard whale theatre and upper-deck side access which helps the operator offer an uncrowded, personalized and immersive experience.

The main deck features a lifting platform on the stern for water-level viewing of aquatic wildlife. The platform has wide access stairs connecting it to the aft main deck. The main-deck cabin seats 100 passengers in booth configuration. Three toilets are located on the aft main deck, with one handicap accessible.

Starboard bow of *Spirit of Migaloo II*
(Photo courtesy Incat Crowther)

A large access from the main-deck cabin leads to the foredeck with its multi-tiered grandstand. To port is a set of stairs from the foredeck to the mid deck, allowing a flow of passengers around the vessel. The mid-deck cabin is open to the wheelhouse, with a wine bar and 34 lounge seats. A further 24 seats are fitted on the sheltered aft deck, whilst

Main-deck cabin on *Spirit of Migaloo II*
(Photo courtesy Incat Crowther)

stairs lead to the roof deck with seats for 40 passengers. An additional toilet is also located on the mid deck.

Spirit of Migaloo II is powered by twin Yanmar 6HYM-WET main engines, delivering 478 kW each and driving through fixed-pitch propellers. The service speed of 25 kn is achieved at modest engine load.

Incat Crowther has a long-standing relationship with Aluminium Marine, with *Spirit of Migaloo II* being the nineteenth product of the partnership. Further projects are already under development, with announcements to come in the near future.

Principal particulars of *Spirit of Migaloo II* are

Length OA	24.8 m
Length WL	24.5 m
Length Measured	23.8 m
Beam OA	8.00 m
Depth	2.50 m
Draft (hull)	1.20 m
(propellers)	1.80 m
Passengers	190
Crew	5
Fuel oil	4000 L
Fresh water	1000 L
Sullage	1000 L
Main engines	2×Yanmar 6HYM-WET each 478 kW @ 2150 rpm
Propulsion	2×fixed-pitch propellers
Speed (service)	25 kn
(maximum)	25 kn
Construction	Marine-grade aluminium
Flag	Australia
Class/Survey	NSCV Class 1C

Lady D and *Lady A* from Incat Crowther

Incat Crowther has announced the delivery of a pair of Incat Crowther 37 passenger ferries to Mexico. Built by Wight Shipyard Co., *Lady D* and *Lady A* have been delivered to Mexico's largest operator, Ultramar, where they will join an extensive fleet of Incat Crowther-designed vessels. The project brings together a long-term Incat Crowther operator and a high-quality shipyard to deliver an outstanding product.

With capacity for 459 passengers, the vessels have been built to a very high quality, notably higher than a regular commuter ferry. The vessels feature Ultramar's signature

Lady D (in foreground) and *Lady A* berthed at Wight Shipyard Co., East Cowes, Isle of Wight, UK, before being loaded aboard ship for delivery
[*For history buffs, the union jack is on the old hovercraft hangar* — Ed.]
(Photo courtesy Incat Crowther)

high-tech fitout with advanced entertainment systems and advanced LED lighting. Whilst giving the operator a distinct point of difference in the market, the fitout brought mass control to the fore. Incat Crowther worked closely with the Wight Shipyard expertise to balance the operator's desires with the fitout requirements in a way that did not excessively impact the vessel's performance, with the final product being delivered below the predicted displacement.

The vessels take a two-and-a-half deck configuration with a half-height wheelhouse giving excellent forward visibility and contributing to the trademark sleek appearance of Ultramar's fleet.

The main deck features three pairs of boarding ramps, two pairs aft and a pair forward. The aft-most pair is dedicated to cargo movements, leading straight to the aft cargo area. Forward of this, a passenger ramp feeds straight to the main passenger cabin as well as to the stairs to the upper deck.

The main-deck cabin seats 165 passengers and has two wheelchair spaces. A bar/kiosk is fitted amidships, adjacent to an interior stair to the mid deck.

A pair of doors forward link the forward-most boarding ramps to the cabin, as well as providing access to the foredeck, which has 32 seats.

The mid deck features a business-class cabin for 24 passengers. Aft of this, the external deck features a stage, where artists perform on return journeys. The aft exterior deck seats 116 passengers. The sundeck seats 122 passengers.

The vessel's platform was optimised early in the design process for efficient operation with twin MTU 12V4000 M63 main engines. Operating at modest MCR, this engine package delivers excellent efficiency whilst minimising wear-and-tear and extending the engine maintenance intervals. The vessel comfortably achieved a trials speed of 31 kn.

By bringing together long-term clients and establishing win-win relationships, Incat Crowther has created an efficient and robust vessel design with class-leading fitout and amenities. The vessel embodies Ultramar's "Experience Innovation" philosophy.

Principal particulars of *Lady D* and *Lady A* are

Length OA		37.0 m
Length WL		36.7 m
Beam OA		8.75 m
Depth		3.30 m
Draft	(hull)	1.50 m
	(propellers)	2.10 m
Passengers		459
Crew		6
Fuel oil		4000 L (day tanks)
		8000 L (main tanks)
Fresh water		1000 L
Sullage		1000 L
Main engines		2MTU 16V4000 M63 each 1500 kW @ 1800 rpm
Propulsion		2×propellers
Generators		2×Kohler 65EOZDJ
Speed	(service)	24 kn
	(maximum)	31 kn
Construction		Marine-grade aluminium
Flag		Mexico
Class/Survey		NSCV Class 1C

Stewart Marler

Seating in the main-deck cabin on *Lady D*
(Photo courtesy Incat Crowther)

Lady D on trials
(Photo courtesy Incat Crowther)

Cruising in NSW

The new cruise-ship wharf in Eden is an extension of the breakwater wharf and includes two berthing and three mooring dolphins, and was officially opened on Sunday 4 August. The opening was hosted by the Port Authority of NSW, in conjunction with office of the Minister for Roads and Transport and member for Bega, Andrew Constance, prior to the start of the 2019–20 cruise season. The new wharf extension will enable large cruise ships of 300 m plus in length to come alongside the wharf, rather than anchoring in Twofold Bay and using tenders to ferry passengers ashore.

The event included a Welcome to Country by B.J. Cruse and Smoking Ceremony, and the official party was accompanied by students from Eden Marine High School and Eden Public School for the official opening, followed by a ceremonial cutting of the ribbon and then a cake, with key Eden community members and stakeholders present.

The first vessel scheduled to berth at the new cruise-ship wharf is *Pacific Explorer* on 15 September. A record 22 vessels are scheduled to berth there over the coming summer cruise season, compared to seven last season when vessels still had to anchor and ferry passengers ashore in the ship's tenders.

Phil Helmore

Natalie Godward, Cruise Development Manager, Port Authority of New South Wales (C) and the Cruise Eden team with the opening cake
(Photo from Imlay *Magnet* website)

Extension to the breakwater wharf in Eden and the innermost berthing dolphin
(Photo courtesy Joanne Korner)

The Chilean Navy's barquentine *Esmeralda* arrived in Sydney on 1 August for a four-day visit as part of her 2019 round-the-Pacific training cruise. She was warmly welcomed by a flotilla of craft including *James Craig*, *Soren Larsen* and *Martindale*
(Photo John Jeremy)

The cruise ship *Carnival Spirit* dominating Sydney Cove during a visit on 13 August. This 88 500 GT ship, which is based in Sydney, was built in Finland and completed in April 2001. With an overall length of 293.52 m and a beam of 32.31 m the ship has a crew of 961 and can accommodate 2124 passengers
(Photo John Jeremy)

Samoa receives Guardian-class Patrol Boat

On 16 August the Australian Government handed over the newest Guardian-class patrol boat *Nafanua II* to the Samoan Government at a ceremony in Henderson, Western Australia.

Nafanua II was received by Samoa's Deputy Prime Minister, the Hon. Fiame Naomi Mata'afa, and the Commissioner of Police, Mr Fuivaili'ili Egon Keil.

The Minister for Defence, Senator the Hon. Linda Reynolds CSC, said that Defence engagement with Samoa is continuing to grow through ship visits, cultural and sports engagements, and community activities.

"The strong and enduring security partnership we have with the Samoa Police Service is evident as we deepen our defence cooperation through the exchange of the Guardian-class patrol boat under the Pacific Maritime Security Program," Minister Reynolds said.

The Minister for Defence Industry, the Hon. Melissa Price MP, welcomed the Samoan delegation and congratulated them on their new capability, designed and built by Australian company Austal.

"The Guardian-class patrol boat programme supports 400 direct and indirect jobs here at Henderson, and is a great example of Australian industry coming together to support our Pacific neighbours.

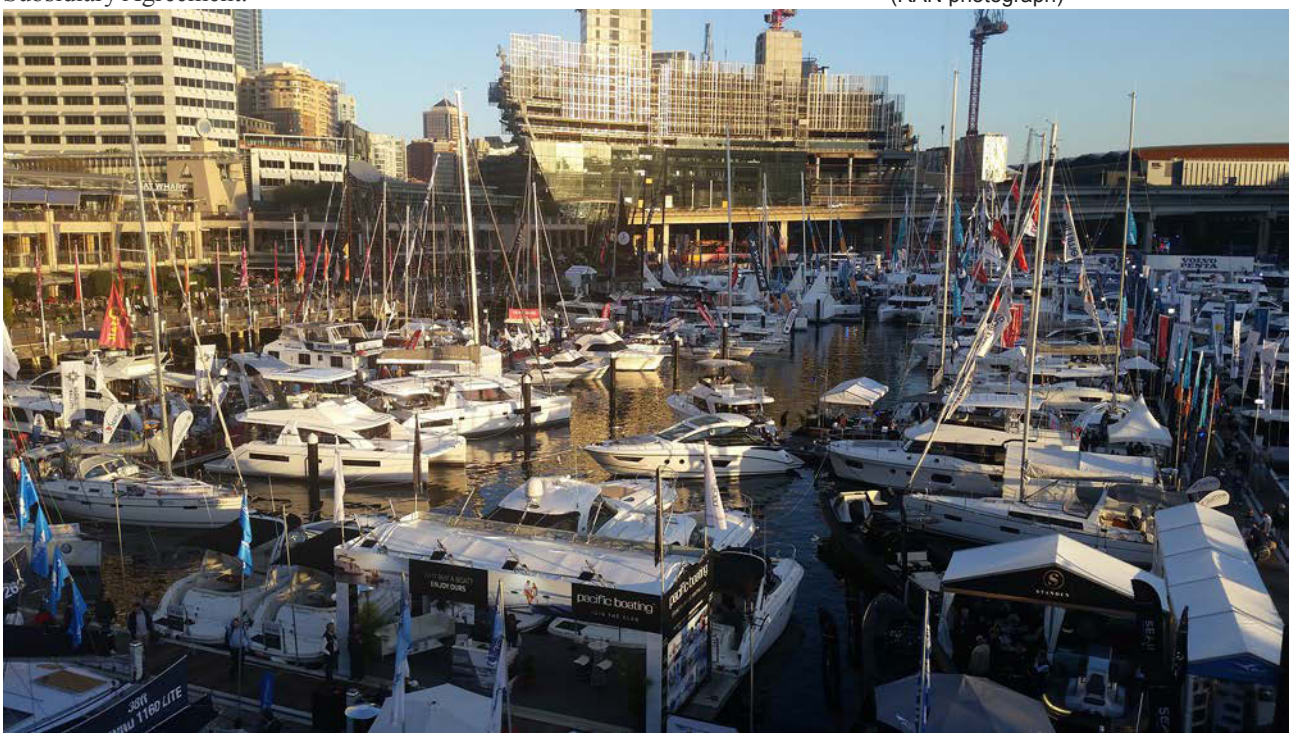
"I am honoured to host the Deputy Prime Minister and Commissioner of Police, along with the crew — including the first three female officers of the Samoa Police Maritime Wing — who are training with our Navy in preparation for the journey home."

Samoa has accepted the request of the Australian Fisheries Management Authority to gather surveillance information in Australian waters during *Nafanua II*'s delivery transit to Samoa. This activity will occur under the Niue Treaty Subsidiary Agreement.

The decades-long commitment to maritime security is part of the Australian Government's $2 billion Pacific Maritime Security Program. One component is the handover of the new vessels, with the first three being delivered to Papua New Guinea, Tuvalu and Tonga.

Head of Engineering, RADM Peter Quinn, RAN, Samoan High Commissioner, Her Excellency Ms Hinauri Petana, Minister for Defence Industry, the Hon. Melissa Price MP, Samoan Deputy Prime Minister, the Hon. Fiame Naomi Mata'afa, and Austal Manager, Ben Wardle, in front of the Guardian-class patrol boat *Nafanua II*
(RAN photograph)

The Samoan Police crew of *Nafanua II*
(RAN photograph)



Cockle Bay in Darling Harbour crowded with boats during the Sydney Boat Show held over the first weekend in August
(Photo John Jeremy)

The Fastest Team on Water

Introduction

On 8 October 1978 Australian motorboat racer Ken Warby became the fastest man on water travelling at 318 mph (511.1 km/h) in jet-powered *Spirit of Australia*, the boat which he built in his Sydney backyard. 41 years later the Warby Motorsport team are back together in an attempt to go even faster. Ken's son David is set to put his own boat *Spirit of Australia 2* to the test; a second-generation jet-powered hydroplane. The attempt will take place on Blowering Dam, the same stretch of water on which Ken broke his world records. David's aim is to not only beat his father's record, but to extend it to 342 mph (550 km/h).

David Warby, crew chief Philip Frawley, engineer Ian Wood and sponsorship manager Gordon Eckel of the Warby Motorsport Team gave a presentation on *The Fastest Team on Water* to an audience of about 60 on 6 June in the Theatre at the Australian National Maritime Museum in Darling Harbour. Dave's partner, CEO and financial controller, Lesa Wilkins, was in the audience, but Dave's father Ken, who lives in Cincinatti, Ohio, USA, was unable to be there on the evening.

The team was introduced by David Payne, Curator of the Australian Register of Historic Vessels.

Spirit of Australia

Dave Warby began the presentation, saying that Ken had grown up in New Lambton, a suburb of Newcastle, NSW, and had seen Donald Campbell break his own World Water Speed Record on *Bluebird K7* on Coniston Water, UK in 1959 on TV. He said immediately "Mum, I am going to break that record!" He started racing hydroplanes at 16 in Newcastle, while he was an apprentice engineer at BHP.

By the early 1970s, Ken had moved from Newcastle to Sydney, was racing hydroplanes at Cabarita, and had started building *Spirit of Australia.* Dave, as a young lad, watched the boat taking shape. By that time, Ken was a sales representative for Makita Power Tools, but he had only three power tools of his own to use in the construction of his boat: a circular saw, a sander, and a drill!

To power the boat, Ken bought a Westinghouse J34 jet engine at auction for $65, and installed it. When the boat was completed, Ken used his sales rep's car to tow the boat to the water, having to stop every so often to let the gearbox cool as the car was barely up to the job! The first trials of *Spirit of Australia* were on Lake Munmorah, NSW, and there he broke the Australian unlimited water speed record of 168 mph (270 km/h).

Dave and his mum and two brothers only ever saw trials of *Spirit of Australia*, as Ken did not want them present at a record attempt in case anything went wrong.

Ken continued development of the boat, but he had no corporate sponsorship and so resorted to painting in shopping centres to raise money to fund his project. Subsequent trials were on the Manning River at Taree.

Ken was aware that Prof. Tom Fink had been an adviser to Donald Campbell on *Bluebird K7*, and had advised Campbell not to exceed 200 mph (322 km/h), which Campbell did with disastrous consequences. So Ken approached Tom Fink, then Dean of Engineering at the University of NSW, for advice on the aero/hydrodynamics of the boat. Tom and Lawry Doctors tested a model of *Spirit* in the wind tunnel at UNSW and gave Ken advice about the tail plane. Tom asked Ken who had designed the boat, because the numbers were so good, and Tom had a hard time believing Ken when he said "I designed it myself"! However, from then on they became firm friends and Tom became part of the *Spirit* team.

Dave was the middle of three brothers, and grew up around Ken's racing of hydroplanes at Cabarita and construction and development of *Spirit*. Ken didn't push Dave into boat racing; he simply got started on his own. Ken's back yard was filled with jet engines, truck engines, as well as *Spirit* under construction. When the tail plane was first installed on *Spirit* in Ken's back yard, Dave and his youthful mates used to stand on it because of the better view of the surrounding neighbourhood from up there!

Lee Taylor had, by that time, taken Donald Campbell's 1964 World Water Speed Record of 276 mph (444 km/h) and raised the record to 285 mph (459 km/h) in his boat *Hustler*. Ken's $65 jet engine was good enough for *Spirit* to break the record on Blowering Dam in 1977 and raise it to 288 mph (464 km/h).

At that stage, Ken was looking for more power from his bargain engine, and the Royal Australian Air Force decided to come on board. They overhauled their own Westingthouse J34 engines (for their Lockheed P-2 Neptune maritime patrol aircraft) at the apprentice training school at the RAAF Base in Wagga Wagga, NSW, and offered to overhaul Ken's engine for him. Ken duly took the engine to the RAAF Base, had lunch with the commandant while the apprentices swapped serial plates with an already-overhauled engine and, when Ken returned from lunch, the commandant said "Ken, could you please get your engine out of my workshop!" Ken installed the overhauled engine into *Spirit* and set about raising his own record.

Back at Blowering Dam in 1978, they were not quite getting there. Ken asked Tom Fink how much resistance the rudder was providing and how much he would have to cut off to get another 20 km/h. Tom advised that at these high speeds, the rudder on *Spirit* was providing about half the total resistance of the boat, but Ken would still need enough rudder in the water to provide accurate steering, and it was a fine line they were walking. After some back-of-the-envelope calculations, Tom said that cutting off 65 mm should do the trick. Ken got out the oxy-acetylene torch and promptly cut off 75 mm from the bottom of the rudder, went out in the boat, and raised the record to 318 mph (511 km/h) [*The oxy-torch marks can still be seen on the rudder on* Spirit *in the ANMM* — Ed.]

Ken Warby thus became the first person to design, build and drive a boat to an unlimited water speed record, the first person to break the 300 mph (and 500 km/h) speed barriers, the first Australian to hold an unlimited speed record, and the first Australian to break the unlimited water speed record.

Spirit of Australia at speed on Blowering Dam
(Photo from Warby Motorsport website)

Aussie Spirit at speed on the Manning River
(Photo from Warby Motorsport website)

After *Spirit*

When Lee Taylor found that his record had been broken by an unknown from Australia who had designed and built his own boat, he could hardly believe it, and immediately set about taking it back. He built a new rocket-powered boat *Discovery II,* a 40 ft (12 m) reverse three-pointer design. This type had not been used in unlimited record attempts before, and Taylor did no long test-and-trials program working up to the record attempt. In 1980, following initial trials on Walker Lake, Nevada, Taylor switched to Lake Tahoe, Nevada/California, USA. When conditions proved unfavourable for the attempt, not wanting to disappoint the assembled spectators and media, he decided to do a test run instead. At 270 mph (432 km/h) the port sponson on *Discovery II* collapsed, sending the boat plunging into the water. The cockpit section with Taylor's body was recovered three days later. The cockpit had not floated as intended and Taylor drowned as a result.

In 1989 Craig Arfons, son of Walt Arfons (builder of the world's first jet car) and nephew of famed record breaker Art Arfons, tried for the record in his all-composite fiberglass/Kevlar jet-powered *Rain X Challenger*, but died when the hydroplane somersaulted at 302 mph (483 km/h).

So Ken now has the longest-standing speed record on the planet of 41 years, with the next best in the water speed record being Malcolm Campbell in *Bluebird K4* (10 years and 10 months), and Lee Taylor in *Hustler* (10 years and 5 months).

After 30 years of his unbroken record, Ken and Dave built a new boat, *Aussie Spirit,* powered by a fresh Westinghouse J34 engine, to attempt to raise the record. At the time, the Union Internationale Motonautique (which regulates and ratifies water speed records), did not require an unlimited water speed record boat to have a reinforced safety cockpit, but Ken built his own 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 bullet-proof. However, by the time *Aussie Spirit* was ready to run on the water, new cockpit rules had been enforced by the UIM. This meant that test samples of a cockpit structure had to be tested before the boat was built. As *Aussie Spirit*'s cockpit was part of the main structure, removing it was not an option, and a new boat would have to be built. It wasn't all bad; Blowering Dam was at an all-time low of 15% capacity, and a record attempt there and then was out of the question, so that gave them time to look at designing and building *Spirit 2*.

Spirit of Australia 2

Here the team showed some slides of the new boat.

The main differences between *Spirit* and *Spirit 2* are all related to safety. In *Spirit,* Ken did not even have a seat belt! He did have a life jacket and a parachute. However, in *Spirit 2*, Dave has a complete safety capsule, life jacket, GPS, tracking and radio communications—all the safety devices you can think of.

Spirit was built in the 1970s in Ken's back yard, and was built of timber and plywood. Since then we have seen the rise in funky composites and carbon fibre. However, *Spirit 2* is also built of timber and plywood, just like *Spirit.* It is cheaper and easier to work with, and its strength is proven. The hull on *Spirit* easily handled a 1 ft (30 cm) chop on the water at 300 mph (483 km/h). There is carbon fibre in the safety capsule, but not in the hull.

Spirit 2's jet engine delivers 5000 lbf (2268 kgf or 22.24 kN) compared to *Spirit*'s 3000 lbf (1361 kgf or 13.34 kN). The boat itself has a displacement of 3800 lb (1723 kg), and so has a thrust-to-weight ratio of about 1.65. However, the boat will never use full power—they expect to reach 342 mph (550 km/h) on about 95% power.

With *Spirit of Australia 2*, Dave can feel what is happening in the boat. Having built the boat, he understands it all and knows what is happening and—more importantly—why it is happening, and can therefore do something about it. Building the boat yourself is critical. If you are scared of the boat, then you shouldn't be in it!

The Rolls-Royce Orpheus Jet Engine

Spirit 2 has a Rolls-Royce Orpheus jet engine which came from the UK. A jet engine is essentially a four-stroke engine: there is the air intake, compression, burning of the fuel/air mixture, and then the exhaust which produces the thrust. So far in trials, they have had the engine up to about 80% power, which gave them 250 mph (402 km/h). and then accidentally went to 90% power! However, the percentage power is not directly related to the speed of the boat. Due to the characteristics of the jet engine power output, going from 80% power to 85% power gives a massive acceleration [*Contrary to what one would expect from a purely hydrodynamic point of view!* — Ed.]

The mass of the jet engine should be not too light, but not too heavy either. The jet engine in *Spirit* was of the order of 1050 lb (476 kg). The jet engine in *Spirit 2* is heavier.

The Team

Here they showed a photograph of the *Spirit* team on the day

Spirit of Australia 2 at speed on Blowering Dam
(Photo from Warby Motorsport website)

when they first started the engine. They included:

Ken Warby	Driver, and backbone of the team
Dave Appleby	Administration and organisation
Rob Blackadder	Engines
Graeme Pheasant	Communications
Rod Apathy	Turn crew

All of these *Spirit* originals are now on the current *Spirit 2* team. Rod Apathy is the son of Bob Apathy, who was the Operations Manager on the original team, but has since passed away.

The new team members include:

Dave Warby	Drive, and backbone of the team
Crew Chief	Phil Frawley
Peter Hayes	Engineering
Ian Field	Engines
Peter Jarrett	Boat trim and balance
John Nordheim	Turn crew
Michael Rose	Turn crew
Colin Eade	Turn crew
Andrew Pratt	Start crew
In Wood	IT/Technical
Gordon Eckle	PR and marketing
Lesa Wilkins	CEO and financial controller
Rowan Bieske	Media Tumut
Ron Walters	Logistics
Christine Pratt	Merchandise
Brenda Walters	Merchandise
Jenny Walters	Merchandise

Sponsors

The team has received sponsorship from the following companies:

Road Tech Marine
Jaycar
AMF (Haggin)
Certus Apac
Norglass
Beastwear
Boat Names
Scanhub
Century Batteries
Fundamental Media
Little Ripper Group
DC Roberts Aviation
808 Squadron RAN
Purple Wax
Cast-in Solutions

Representatives from Norglass and Cast-in Solutions were in attendance at the presentation, and attend all the tests and trials.

The team is grateful to all sponsors because, without them, the record attempt could not take place.

Tests and Trials

The most-common question Dave is asked is "When are you going to attempt the record?"

There is no straightforward answer. Ken took four years to work up to the record in *Spirit*, creeping the speed up, analysing what was happening at each increase, and correcting problems along the way until he felt comfortable to increase again. Dave is treating the testing in exactly the same way.

Running trials is no simple matter. The water has to be cleared of all other water craft; i.e. Blowerting Dam has to be closed to all other users. They have to have four boats from Roads and Maritime Services there to monitor the situation at around $3200 per day each, plus six SES boats which are run by volunteers, plus the fire brigade. Before each run, the water has to be swept clear of debris, because the hull hitting anything at 300 mph (483 km/h) would likely be catastrophic.

Problems and Gremlins

So far, they have experience problems with the following:

Rudders
Start batteries
Balance and centre of gravity
Steering cables
Starter motors
Transom setup
Vertical stabiliser

Dave has a Skype camera set up in the cockpit of the boat so that he can live stream the feed to Ken in the USA, and Ken can see what Dave is seeing, and tell Dave how he could do it better!

When they started, they put the same rudder on *Spirit 2* as they had on *Spirit*. Here David Payne had come to their aid, and taken measurements for them of *Spirit's* rudder in the ANMM. However, they found that it did not work properly. Above about 120 mph (193 km/h) it tended to pull one way. They figured that the back of the boat was lighter and so there was less wash off the ski, and they needed a different, deeper rudder.

The Roll-Royce Orpheus engine originally had a cartridge start, but here they converted it for electric start, and so they needed big batteries. They came up with the size with the help of Kurri Kurri TAFE.

It is important to have the balance of the boat right, and you can tell a lot from the video footage of the boat at speed. Early videos of *Spirit 2* on Blowering Dam showed pulsing of the rooster tail but, after changing the balance of the boat, she now has a clean rooster tail at the speeds tested so far. The rooster tail on *Spirit* was clean and stretched for nearly a kilometre! However, looking at videos of *Bluebird K7*, even on flat water the rooster tail shows major pulsing.

Spirit 2 has a vertical stabiliser which seemed to be pulling the boat to one side at speed, maybe because of incorrect alignment, so they built a new one and aligned it very carefully.

Spirit 2 has no T-foil, where *Spirit* had one. Ken needed to lift the aft end of the boat for balance, but they do not need

to do that on *Spirit 2* as she has her centre of gravity further forward, is more nose-heavy, and they have had to add some ballast in the aft end.

They are finding problems as they increase speeds, and solving them as they go.

Local Support

The support from the locals at Blowering Dam has been awesome, including the following organisations:

State Emergency Services
NSW Volunteer Rescue Association
Roads and Maritime Services
Rescue divers
NSW National Parks and Wildlife Service
WaterNSW
Snowy Valleys Council
Talbingo Tourist Park
Tumut Crane Hire
Randy Engineering
ABC Radio Tumut
Tumut Rotary

Where they are Today

Most of the problems have been solved, the team training is complete and now, when they do tests and trials, the whole operation runs like clockwork. Most importantly, they are safe. They are going by how the boat feels and, if it does not feel 100% OK, then they don't push it.

In their last tests at Blowering Dam, they did three runs at 217 mph (350 km/h). They expect to be back at Blowering Dam on the weekend of 31 August and 1 September, then in October and in December. Ideally they need a 12 km run but, due to the low level in Bowering [*currently at 49% and falling* — Ed.] they only have 4 km.

Questions

Question time was lengthy and elicited some further interesting points.

There is a historical connection to Taree. *Spirit* was tested on the Manning River at Taree, and the timber for both *Spirit* and *Spirit 2* came from there.

Turning the boat around at the end of a run requires another boat and a turn crew. An incident occurred when *Spirit* was being run in the early days on Botany Bay at St George and, when turning the boat around, Ken blew the St George sailboats over!

Spirit 2 handles differently to *Spirit*. Ken says that you could steer *Spirit* with two fingers on the steering wheel, but Dave has to man-handle *Spirit 2* with more than two fingers!

Dave is a UIM-certificated capsule builder, and the safety capsule on *Spirit 2* has been well built, maybe even over-built.

The team prefer to run on water with a slight ripple. Ken says that when transiting from water with a 1 in (25 mm) ripple to water which is as smooth as glass, *Spirit* would lose 20 km/h.

The vote of thanks was proposed by David Payne and carried with acclamation.

Phil Helmore

Turbinia: the First Steam-turbine-powered Ship

Em/Prof. Lawrence Doctors
UNSW Sydney

The author recently had the opportunity to visit the Discovery Museum [1] in Newcastle-upon-Tyne, UK, where the famous ship *Turbinia* is the centre of attraction on the ground floor. The ship was designed and developed by Charles Algernon Parsons, after his invention of the steam turbine in 1884. It is the first steam-turbine-powered ship and, eventually, achieved a speed of 34.5 kn (62.9 km/h) [*And held the world water speed record 1897–1903!* — Ed.]. The ship was first demonstrated in public on 26 June 1897, at the Navy Review for the Diamond Jubilee of Queen Victoria at Spithead, UK.

The vessel is described in detail in a Wikipedia article [2], so the space here is utilised to present photographs taken by the author and to put forward some of his impressions. The well-known view of the vessel at speed, extracted from the Wikipedia article is reprinted in Figure 1 and an aerial view of the restored vessel in the Discovery Museum is shown in Figure 2. The vessel has been modified to include a large area around the engine room, where the steel plating of the hull has been replaced with transparent plastic. This allows visitors to inspect the intriguing and compact machinery inside the hull. These two photographs illustrate the high slenderness ratio of the vessel, which is 9.085, according to the technical data.

Figure 1 *Turbinia* at speed in 1897
(Photo from Wikipedia website)

A stern view of the vessel is shown in Figure 3. This shows the bizarre truncated transom stern, above which the stern is scalloped out. The hydrodynamic purpose of this design is unclear. Also of note are the three propeller shafts, each fitted with three propellers, arranged one behind the other at equal intervals. It is understood that the initial performance of *Turbinia* was not up to expectations; consequently, Parsons performed a number of experiments in order to raise its speed. Thus, the original propulsion arrangement involved only one shaft. It would make an excellent thesis project to compare different designs, such as one propeller on each shaft, or simply one propeller on one shaft.

Figure 2 Aerial view of *Turbinia* as restored in the Discovery Museum
(Photo courtesy Lawry Doctors)

Figure 3 Stern view of *Turbinia*
(Photo courtesy Lawry Doctors)

Considerable research and development were invested in the design of *Turbinia*. This statement is attested by the models which Parsons built. The large *Turbinia* model, powered by a rubber-band driving a single propeller through gearing, is shown in Figure 4. One can see the abovementioned strange stern, as well as the laterally offset rudder. The smaller model, also powered by a rubber band, is presented in Figure 5.

Figure 4 Large *Turbinia* model with single propeller
(Photo courtesy Lawry Doctors)

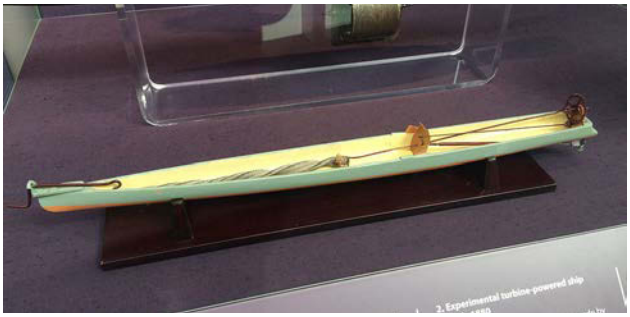


Figure 5 Small *Turbinia* model with single propeller
(Photo courtesy Lawry Doctors)

Three of the propellers designed by Parsons are on display in the Discovery Museum and are shown in Figure 6. The torque meter which he developed is seen in Figure 7. This mechanical torque meter consists of two parts, each part being fixed to the opposing ends of the propeller shaft where it is sectioned for the purpose of monitoring the transmitted power. The two parts of the torque meter are connected by a spring arrangement so that the deflection of an indicator needle (seen slightly above the centre of the photograph) would be proportional to the transmitted torque.

Figure 6 Sample propellers
(Photo courtesy Lawry Doctors)

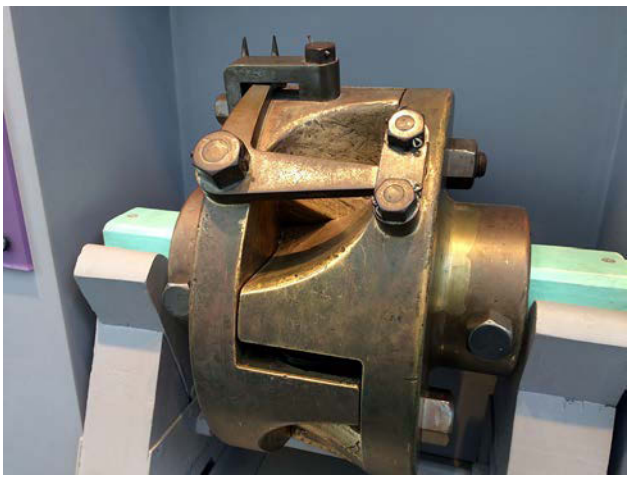


Figure 7 Mechanical torque meter
(Photo courtesy Lawry Doctors)

It is well known that a fundamental and major problem with the design of propellers for such a high-speed vessel is the matter of cavitation. The minimisation of cavitation (or, better still, its elimination) is based on reducing the suction pressure on the back of the propeller or propellers. The most straightforward way of achieving this aim is to increase the surface area of the propeller, either by increasing the blade-area ratio or by increasing its diameter, or both. Alternatively, redistributing the load on each propeller by increasing their number is an obvious choice. This was the route chosen by Parsons.

To this end, Parsons designed the world's first cavitation tunnel. A photograph of his original tunnel appears as Figure 8. The display of this famous cavitation tunnel in the Discovery Museum is somewhat obscure and disappointing, with it being awkwardly positioned and very difficult to examine, as well as missing both a label and explanatory inscription. The author had previously seen this tunnel in 1991 when it was in the possession of the University of Newcastle-upon-Tyne. The tunnel at that time was fully operational and one could indeed view a model propeller suffering from cavitation in the working section. The oval viewing window is located at the left-hand end of the top straight section of the recirculating tunnel.

Figure 8 Parsons' original cavitation tunnel
(Photo courtesy Lawry Doctors)

[*The tunnel was also fully operational and on display at PropCav'95, the International Conference on Propeller Cavitation, held at the University of Newcastle-upon-Tyne in 1995 to mark the 100 year anniversary of Parsons' cavitation tunnel* — Ed.]

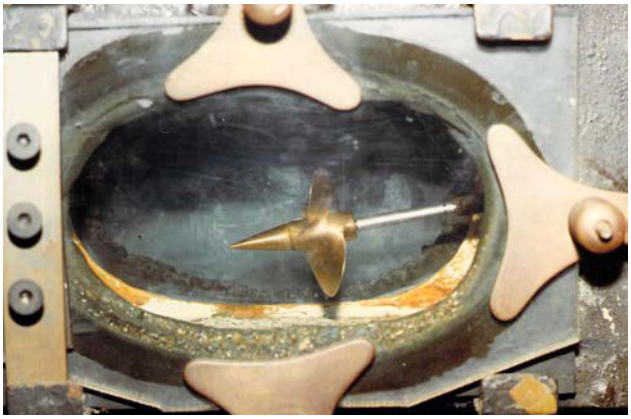


Figure 9 Working section of Parsons' original cavitation tunnel in 1995
(Photo Phil Helmore)

References

[1] Discovery Museum in Newcastle-upon-Tyne, UK, URL https://discoverymuseum.org.uk/.

[2] Wikipedia, URL https://en.wikipedia.org/wiki/Turbinia.

[3] YouTube, URL https://www.youtube.com/watch?v=w5bQqih0GEA (videoclip).

EDUCATION NEWS

Australian Maritime College

Charting AMC's Course

Michael van Balen AO wants the AMC to capitalise on the Australian Government's unprecedented $90 billion National Naval Shipbuilding Enterprise.

AMC, through the University of Tasmania, is seeking a major role in the unprecedented construction program of submarines, frigates and offshore patrol vessels over the next 30 years through the establishment of a Maritime Defence Innovation Design Precinct (MDIDP) at the Newnham campus. This comes on top of the College's traditional role as the national institute for maritime education, training and research.

Mr van Balen is a retired Australian Rear Admiral and was Deputy Chief of Navy before he left the service after an outstanding 38 year career which included stints as the Commanding Officer of HMAS *Sydney* and Chief Defence Force Liaison Officer to the United States Central Command. He was enjoying life at Port Macquarie, NSW before the AMC opportunity came calling.

"We are in the middle of developing a strategic plan for AMC," he said. "There is plenty of opportunity out there."

Mr van Balen is keen to optimise the AMC's and, indeed, Tasmania's involvement, in the National Naval Shipbuilding Enterprise.

"Through the MDIDP, we aim to become an integral part of the Defence network, using AMC's unique research facilities and niche skill sets to advance Defence and defence industry requirements."

"With the onset of the naval shipbuilding program, Navy is becoming a 'parent Navy' whereby it assumes responsibility for the design, performance and configuration control of its new vessels, a role which was previously performed by the country from which the vessels were purchased."

"The Navy therefore needs to have knowledge around the capabilities of the vessels so that, if there is an issue, such as a design element producing an excessively noisy submarine, we identify the problem early and have the knowledge to fix it .

Mr van Balen said that the AMC would assist by contributing innovative research know-how and facilities to Defence, to enable it to operate the ships and submarines in the most operationally effective manner.

"Our contribution will be to systems and the research involved: how does the hull move through the water, what cavitation is created by this shape of propeller and does that meet our requirements or do we need to change it, is that platform stable enough to do this? We can conduct all that research here.'

"The MDIDP will be the venue where all the parties involved, defence industry, Government agencies and suppliers, come together to look at the issues they are facing and determine a way forward."

The Australian Government committed $30 million to the first phase of the project during the Federal election campaign.

More broadly, Mr van Balen says that advances in technology, such as autonomous shipping, will impact the future of the maritime industry. AMC must be prepared for these changes. The AMC presently has more than 500 students, about half of whom are international.

"We would like to grow our domestic student population and encompass the Government's initiatives with STEM (science, technology, engineering and maths)," he said.

AMC Courses Endorsed by Naval Shipbuilding College

The Australian Maritime College has teamed up with the Naval Shipbuilding College to ensure that its graduates are ready to secure future jobs flowing from the Australian Government's $90 billion Naval Shipbuilding Enterprise. The AMC's courses have been endorsed by the NSC as being aligned with the future employment needs of the naval shipbuilding industry.

A number of other prominent education and training providers across Australia have also been endorsed.

The NSC was established in 2018 to ensure sufficient skilled labour for the Shipbuilding Enterprise.

AMC Principal, Michael van Balen AO, said that the AMC was committed to the partnership with the NSC to provide high-quality education and pathways into shipbuilding careers for students.

"The partnership will ensure that our graduates are well positioned for the large number of job opportunities that is being created as a result of the growth in the shipbuilding industry," he said.

Mr van Balen said that a workforce comprising thousands of skilled Australians was critical to the building of Australia's modernised and strengthened naval fleet and of a sovereign shipbuilding industry.

"To support the development of this skilled workforce, the Australian Government established the Naval Shipbuilding College and has invited people interested in a career in the shipbuilding industry, to register with them," he said.

"The Workforce Register enables people from around Australia who are interested in long-term shipbuilding career opportunities to express their interest and receive assistance through the skilling and employment process.

"This may include current university students seeking work experience and graduate program opportunities as part of their pathway to employment.

"To date, Tasmania has supplied only 46 of the 1192 applications to the National Workforce Register.

Naval Shipbuilding College program director, Bill Docalovich, said that the unprecedented upgrade of the Royal Australian Navy's fleet was taking a national approach with investment in the future skilled workforce.

"There are opportunities throughout Australia to secure long and rewarding careers in areas of production and sustainment across the Naval Shipbuilding Enterprise and, through this course-endorsement process, we're helping students to graduate job ready," Mr Docalovich said.

The endorsed AMC courses include:

- Bachelor of Engineering (specialisation) with Honours, with options in naval architecture, marine and offshore engineering and ocean engineering.
- Bachelor of Engineering (Marine and Offshore Engineering) with Honours.
- Master of Engineering (Maritime Design).
- Bachelor of Global Logistics and Maritime Management.
- Master of Business Administration (Maritime Logistics Management).

AMC and TAFE SA Engineer new Pathways

New engineering education pathways between the Australian Maritime College (AMC) and TAFE SA will help deliver an advanced maritime workforce for the $90 billion Naval Shipbuilding Program.

AMC and TAFE SA have created a flexible education pathway aimed at encouraging students to complete the courses they will need to qualify for future jobs.

In front of students and staff from 20 South Australian schools, it was announced that graduates of seven TAFE SA programs would now qualify for automatic entry into the AMC's world-famous degree programs. They will also receive credits which shorten the time it takes to complete their degrees by up to one third.

The Associate Degrees in Electronic Engineering, Electrical Engineering, Biomedical Engineering and Civil Construction (Design Drafting) and (Site Management) have been mapped for automatic entry with credit into AMC's maritime engineering programs.

The Diploma of Engineering — Technical and the Diploma of Project Management have been mapped with automatic entry with credit into the AMC maritime and logistics management degree.

AMC Principal Michael van Balen AO said that the maritime industry was in a transformative phase.

"The shipyard of the future is becoming increasingly digitised and the demand for people with advanced skills and capabilities is intensifying," he said.

'The purpose of this education pathway program is to make sure that a young person in Adelaide, who might want to start in welding, is given every opportunity possible to keep upskilling and, if desired, to move into other fields of the maritime industry as their personal skills, confidence and expertise grows."

Penny Johnston, Director of Defence Industries at TAFE SA, said "The education pathway established in Adelaide will help students in South Australia and beyond to get jobs in the massive ship and submarine building program that is underway in this state.

"It is our intention to make sure that as much of the workforce as possible is Australian, and that South Australians are given every opportunity possible to obtain the qualifications they need to participate in these incredible projects".

The University of Adelaide

ASC and University of Adelaide Team for Training

A rejuvenated Master of Marine Engineering (MME) program, backed by the expertise and resources of ASC, is seeing dozens of post-graduate students at the University of Adelaide prepare for a career building and sustaining Australia's current and future submarines.

This year, 49 students are undertaking the master by coursework in submarine design (naval architecture and maritime engineering), sustainment, supply chain, project management and related subjects, as part of the School of Mechanical Engineering, University of Adelaide. The program, offered every two years, has grown from 27 students in 2017 and nine students in 2015.

The students are drawn from industry, Defence, recent graduates, as well as French exchange students from the prestigious École Nationale Supérieure de Techniques Avancées de Bretagne (ENSTA), which last year signed a collaboration agreement with the University of Adelaide. As part of the course, each student completes an individual project developing a submarine concept design using professional tools.

The ramp-up in enrolments for the master course reflects the place Adelaide will occupy at the centre of submarine and major warship design and construction in coming decades, under the national bi-partisan approach to naval shipbuilding.

ASC instructors are internationally-recognised subject-matter experts with experience working on more than ten submarine classes from UK, France, Spain, Sweden and Australia.

Chief Executive Officer, Stuart Whiley, welcomed the recommitment to the MME program in 2019.

"ASC is the repository of more than 30 years of experience and knowledge which has been honed and updated to ensure that the Collins-class submarine remains a regionally-superior submarine for the nation. So it's a natural fit for ASC and the University of Adelaide to be collaborating in this area," he said.

"ASC has the people and expertise to not only help design and build the RAN's future submarines, but also to develop the skilled workforce required to deliver Australia's naval shipbuilding plans in coming decades."

The Master of Marine Engineering delivered by ASC and the University of Adelaide is among few post-graduate degrees available in Australia in marine engineering, and is the only one devoted to submarines.

Newly-appointed program director, A/Prof. Eric Fusil, said that the masters students were highly motivated.

"We are at the start of a historical and challenging build-up in the submarine sector in Australia. The students are drawing on an incredible wealth of real-life experience in terms of submarine engineering at ASC — Australia's only established submarine company," said Mr Fusil, a former submarine designer with both Naval Group of France and ASC in Adelaide.

In recognition to the high standards of achievement, students are being offered free membership with the prestigious Royal Institution of Naval Architects and the students' best projects are presented to the Submarine Institute of Australia's Technical Conference, SubsTec.

For details on the suite of Marine Engineering programs co-developed by ASC and the University of Adelaide, visit www.adelaide.edu.au/degree-finder/ and search for 'Marine Engineering'.

NSC Agreement with TAFE NSW

The Naval Shipbuilding College and TAFE NSW have signed a Memorandum of Understanding, to help more people become qualified for careers in the rapidly-expanding naval shipbuilding, supply and sustainment industries. On 3 July 2019 an official signing ceremony was held at Fleet Base East, Sydney. In attendance at the signing ceremony were NSW Minister for Skills and Tertiary Education, the Hon. Dr Geoff Lee MP; NSW Defence Advocate, Air Marshal (Ret.) John Harvey AM; and Naval Shipbuilding Institute Executive Director, Ian Irving.

The signing of the agreement between the Naval Shipbuilding College and TAFE NSW
(RAN photograph)

Defence sees a High-tech Future based on Skilled Workforce

On 12 August the Department of Defence released its Science, Technology, Engineering and Math (STEM) Workforce Strategic Vision 2019–30 in Canberra as part of its celebrations marking National Science Week.

The Chief Defence Scientist, Prof, Tanya Monro, launches the Department of Defence Science, Technology, Engineering and Math (STEM) Workforce Strategic Vision 2019-30
(Photo courtesy Department of Defence)

The Chief Defence Scientist, Prof. Tanya Monro, said that the Department of Defence will collaborate with industry and academia to build the high-tech workforce required to meet Australia's future Defence and national security needs.

"These are the careers of the future and competition for people with these qualifications is fierce — it is estimated that 75 percent of the fastest-growing occupations in the world today require people with STEM skills."

"In Australia there is a growing requirement for a workforce with the necessary skills to drive innovation and that ensure we remain competitive in a tough global economy.

"Defence aims to shape the national agenda in science, technology, engineering and maths studies, and inspire future generations of Australians to pursue careers within Defence.

"If Defence is to develop a high-tech force, it needs a larger

and more specialised STEM workforce of both uniformed and civilian personnel.

"It also needs a continuous and reliable pipeline of graduates with science, technology, engineering and maths backgrounds to attract and retain the best and the brightest in their fields."

This year, Defence is expanding its STEM cadetship program from 50 interns to 200 cadets. This creates new opportunities for students to start developing their career at Defence whilst undertaking their studies.

UNSW Sydney

Undergraduate News

Thesis Structure

The structure of thesis in the School of Mechanical and Manufacturing Engineering has changed for all students commencing thesis in 2019. There are now two thesis options:

Practice Thesis

Practice thesis aims to deliver high-quality hands-on experience for students who would like to apply their engineering knowledge to solve real-life engineering problems. Most students are expected to undertake this thesis option and enrol in coursers MMAN4010 and MMAN4020, taken over two consecutive terms, similar to the previous arrangement.

Research Thesis

Research thesis aims to deliver high-quality research-intensive experience for students who would like to continue in postgraduate research or research-and-development in industry in their future. Students who choose this thesis option will need to locate and come to an agreement with a supervisor, and then enrol in courses MMAN4951, MMAN4952 and MMAN4953, taken over three consecutive terms.

All courses occur in every term, and the total units of credit are the same for each option.

Thesis B Conference

The School's undergraduate Thesis B Conference for MMAN4020 in Term 1 took place on 1 June. The following presentations on naval architecture student projects were made:

Gianluca Viluce — *Setting Acceptance Criteria for Detailed Stress Analysis on Container Ships: Correlation between Linear and Non-linear FEA Approaches*

Tamasin Welch — *Passenger Flow in Large Cruise Ships*

RINA–DST Group Award

RINA and DST Group jointly offered an award and certificate for the best presentation by a student member on a naval architectural project at the Thesis B Conference. Assessment was made on the basis of marks awarded by School staff. The award went to Gianluca Viluce for his presentation on *Setting Acceptance Criteria for Detailed Stress Analysis on Container Ships: Correlation between Linear and Non-linear FEA Approaches*. The award and certificate were presented to Gianluca by Phil Helmore.

Phil Helmore (L) presenting the RINA–DST Group Certificate to Gianluca Viluce
(Photo courtesy Helen Wortham)

Thesis Topics

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

Dynamically-supported Sailing Monohulls: An Investigation of a Forward-mounted Foil and its implication for the Hydrodynamic Efficiency of an Aft-mounted foil

Rapid development in hydrofoil design has largely aimed at increasing the operating speeds of sailing vessels. In the previous decade, dynamically-supported sailing boats have taken over some of the most prestigious classes and events in the competitive sailing world. These boats are supported dynamically by way of hydrofoils and were first widely adopted by the international moth class in 2002, with the America's cup following closely after. The 2013 America's Cup featured 72 ft (21.9 m) hydrofoiling catamarans, and this was the first instance of hydrofoiling in the America's Cup. These 72 ft catamarans were difficult to manouevre and were notoriously dangerous vessels to sail. The 2017 competition revised the rules and featured 50 ft (15.2 m) hydrofoiling catamarans which were much easier to manouevre and less dangerous than the previous iteration of AC design. The latest competition rule features 75 ft (22.9 m) hydrofoiling monohulls with a venture into side-mounted canting foils and a single rear foil. This revolutionary class rule generates an entirely new field of research and, due to the rapid developments in hydrofoil technology, have accelerated their implementation into sailboat racing. These developments have largely been driven by the America's Cup and its venture into a new era of hydrofoil racing. Another recent hydrofoiling competition is SailGP, featuring the America's Cup boats from the last iteration of the competition in 2017. These boats have been built to reach speeds of up to 50 kn, a speed which causes the onset of cavitation over the hydrofoils.

In a yacht-racing sense, hydrofoiling hulls are a relatively infant class when compared to the more traditional displacement hull classes. In essence, hydrofoils provide an alternative method for supporting yacht hulls in the water. Traditional hulls are supported by way of displacement, where their buoyant forces displace the water immediately

surrounding the hull, providing support the entire way around the wetted surface of the hull. Hydrofoiling hulls are supported by at least one forward foil and two rear foils which provide lift (similar to an airfoil) and allow the entire hull to "fly" out of the water. This significantly reduces the wetted surface of the hull, which reduces dynamic forces such as frictional drag forces.

Due to the infancy of the field, most of the developments of sailing hydrofoils are experimental through America's Cup teams and individual refinements, with very little published work pertaining to sailing hydrofoils. The broader hydrofoiling field extends to military and commercial vessels which are mechanically propelled. Much of this literature is relevant to sailing hydrofoils; however, due to the force imbalance inherent in sailing vessels, some tweaks are required.

Mitchell Evans is conducting an investigation of the downstream fluid flow patterns of a forward-mounted foil, and the effect which these flow patterns have on the performance of the rear-mounted foil. It is intended to determine optimal configurations of different hydrofoil layouts for monohulls. A preliminary CFD model will be explored, along with experimental models. The intention is to analyse the flow over the two hydrofoils in the wind tunnel, and relate these back to hydrodynamics through CFD and comparing the Reynold's number of a foil of the same shape and velocity bounded by water flow.

Graduation Ceremony

At the graduation ceremony on 17 May, the following graduated with degrees in naval architecture:

Angus Bratter	BE	
Patrick Doherty	BE (Hons)	
Billy Gosper	BE	H2/2
Edward Hawkins	BE (Hons)	H1
Samuel Henson	BE	
Patrick McManus	BE	H2/1
Yun Wang	BE (Hons)	H2/2

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

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 3 for the best performance by a student in Year 3 of the naval architecture degree program was presented to Isabella Yan by the Chair of the NSW Section of RINA, Valerio Corniani.

The Royal Institution of Naval Architects (Australian Division) Prize for the best ship design project by a naval architecture student to Isabella Yan by former President of the Australian Division of RINA, John Jeremy. Isabella's design was for a 33 m high-speed catamaran ferry and sightseeing tour boat operating out of Townsville, Qld.

The David Carment Memorial Prize and Medal for the best overall performance by a student in the final year went to Edward Hawkins.

Congratulations to all on their fine performances.

(L to R) Billy Gosper, Edward Hawkins, Yun Wang, Phil Helmore, Patrick McManus, Samuel Henson
(Photo courtesy Amanda Harris)

Valerio Corniani (L) presenting the RINA NSW Section Year 3 Award to Isabella Yan
(Photo courtesy Stef Salamanca Clavijo)

John Jeremy (L) presenting the RINA Australian Division Award to Isabella Yan
(Photo courtesy Stef Salamanca Clavijo)

Graduates Employed

Our graduates are now employed as follows:

Angus Bratter	Thales Australia, Sydney
Patrick Doherty	One2three Naval Architects, Sydney
Billy Gosper	McConaghy Boats, Gosford
Edward Hawkins	Australian Energy Market Commission, Sydney
Samuel Henson	Botany Timber, Sydney
Patrick McManus	One2three Naval Architects, Sydney
Yun Wang	One2three Naval Architects, Sydney

Phil Helmore

Post-graduate and Other News

Presentation on Hydrodynamics

A presentation on *Hydrodynamics of High Performance Marine Vessels* was made by Lawry Doctors to the Department of Naval Architecture and Marine Engineering at The University of Strathclyde in Glasgow, Scotland, on 17 May 2019. The talk was essentially a brief summary of the application of resistance theory to transom-stern vessels, as described in his book with the same title. The resistance of other advanced marine vehicles was also presented.

The talk was included as Number 75 in the "Lunch and Learn" series organized by Dr Zhiming Yuan in the Department. This series of talks is directed principally at the academics and the postgraduate students.

Reference

Website of book *Hydrodynamics of High-Performance Marine Vessels*:
Volume 1: http://www.amazon.com/dp/1984390910
Volume 2: http://www.amazon.com/dp/198439102X

HoverShow 2019

Lawry also had the opportunity to attend HoverShow 2019 which was held on the site of the Hovercraft Museum on 25 to 27 May 2019. This museum is located at Lee-on-the-Solent, near Gosport, UK. It has the largest collection in the world of full-scale and model hovercraft. The museum also has an excellent repository of historical material on the subject. This material, consisting of reports, photographs, and movies, is undergoing digitising and will be archived so that it will be accessible via computer.

Many of the full-scale hovercraft on display have already been restored. These include the SR.N5 which was the first mass-produced hovercraft, as well as its much-modified successor, the twin-propeller Super SR.N6, which has a greatly improved passenger capacity and a much superior performance, as well as a considerably lower fuel consumption. The world's largest and fastest passenger-and-car-carrying hovercraft, the Super SR.N4, is now being restored. This ferry had a scheduled speed of 60 kn and, with a light load in sufficiently-calm conditions, could reach a speed of 90 kn.

One of the main attractions of HoverShow was the frequent appearance and demonstration of the new Griffon Hoverwork 12000TD passenger craft, shown in the accompanying photographs.

References

[1] Hovercraft Museum website: https://www.hovercraft-museum.org/.
[2] HoverShow 2019 YouTube Trailer: https://www.youtube.com/watch?v=7eJwsAgmZFQ.
[3] Arrival of Super SR.N4 Princess Anne: https://www.youtube.com/watch?v=8M8fsciJKfQ.

Lawry Doctors

Griffon Hoverwork 12000TD under construction
(Photo courtesy Griffon Hovercraft)

Griffon Hoverwork 12000TD approaching the shore
(Photo courtesy Lawry Doctors)

Skipper of Hoverwork 12000TD (L) with Helen and Lawry Doctors
(Photo courtesy Hovertravel)

INDUSTRY NEWS

Civmec Facility Takes Shape

Civmec has achieved a significant milestone in the construction of its purpose-built assembly and maintenance hall in Henderson, Western Australia. The mega structure has been rising from the ground since October last year, when the Prime Minister, the Hon. Scott Morrison MP, was onsite to witness the erection of the first steel for the new world-class facility.

The building now stands at 70 m high, with the recent addition of the 27 m high-bay structure which sits atop the expansive main roof. The 600 t structure, with a length of 130 m and width of 40 m, was securely lifted using hydraulic strand jacks and placed with incredible precision, with a mere 20 mm clearance in several areas.

"Placing the high-bay structure presented the team with a significant challenge. It was a complex process which required meticulous planning, and I congratulate and thank the team for their commitment and focus in achieving this momentous milestone on the project," said James Fitzgerald, Executive Chairman.

The new building contains 20 overhead travelling cranes, with the central hall having an impressive 400 t lifting capacity. The 60 m ocean-facing sliding doors are amongst the largest in the world, able to accommodate the transfer of vessels and large modularised structures. The facility has over 1 200 000 m^3 of internal space, which is equivalent to an area that could house 12 000 passenger buses. To date, approximately 4900 t of structural steel and 14 000 m^3 of concrete have been used in the structure, with an estimated total of 5100 t of steel and 21 000 m^3 of concrete required for the entire build.

When complete, the facility will be amongst the most efficient and innovative in the world, delivering a new world-class resource to the Australian maritime landscape and significantly enhancing the capability of Civmec's existing facilities available at the Australian Marine Complex in Western Australia. The 53 000 m^2 (usable floor area) and 18-storey high facility will be the largest undercover modularisation and maintenance facility in Australia, with the capacity to house large vessels, including complete air-warfare destroyers, frigates and offshore patrol vessels, for construction or maintenance, as well as large integrated modules for the oil-and-gas and metals-and-minerals sectors.

"Our substantial investment in this new facility, capable of handling any of Australia's major projects across the resource, infrastructure and defence sectors, is an integral element in securing the company's long-term future. It is a significant piece of industrial infrastructure and, when fully operational, will provide employment opportunities for up to an additional 1000 Australians, including 100 new apprentices and trainees," said Patrick Tallon, Chief Executive Officer.

Civmec's new building at Henderson (L)
(Photo courtesy Civmec)

New Materials Research to Enhance Submarine Stealth

In late May the Department of Defence signed a three-year collaboration agreement with universities and industry to develop new acoustic materials which will make Australian submarines harder to detect.

The $1.5 million Defence Science and Technology (DST) agreement, supported by the Next Generation Technologies Fund, will produce new materials to reduce the acoustic signature of submarines without disrupting their operation.

Researchers from DST, the University of Melbourne and RMIT University will join with industry partners QinetiQ and Matrix Composites & Engineering to develop the prototype stealth materials.

Chief Defence Scientist, Prof. Tanya Monro, said that the agreement was another step forward in leveraging acoustic science, materials science, engineering, and technological innovation across Australia to develop new Defence technology solutions.

"Emerging materials and next-generation platforms are vital to creating sustainable sovereign capability for the Navy to support Defence's current and future needs across the maritime domain," Prof. Monro said.

"This innovative research has the potential to enhance underwater-vehicle survivability, as well as operational effectiveness."

The research team will be led by University of Melbourne's Prof. Graham Schaffer with Chief Investigators Prof. Tuan Ngo and Dr Christian Brandl, RMIT University's Prof. Peter Daivis, and DST's Dr Ellie Hajizadeh.

HydroComp PropCad® 2019 Released

To support the continuing trend of larger screens and multiple monitors, PropCad has been extended to support a dockable and fully-sizable display window. The feature is accessible through the View menu

Automated Feature Extraction from STL Files

PropCad 2019 includes several new features which automate this process even further:

- automatic removal of edge surfaces;
- optional smoothing of offsets;
- direct creation of distribution files (*.sect);
- support for manual removal of offsets; and
- support for multiple STL surface hatches.

These new options are included in the settings table of the utility. They greatly improve the speed and usability of the Propeller CAD Import utility, allowing users to painlessly create parametric design files from full 3D data in minutes.

Updated 2019 Classification Society Rules

Propeller designs and manufacturers have come to rely on PropCad's integrated Classication Society Rules to automatically calculate required blade thickness for fixed-pitch, controllable-pitch and ducted propellers. HydroComp PropCad includes updates for the 2019 rules for American Bureau of Shipping, Bureau Veritas/RINa, Nippon Japan, Korean Registry, Lloyd's Register, Chinese Classification Society, the Indian Registry of Shipping, and Swedish-Finnish Baltic Ice rules.

HydroComp NavCad® 2019 Released

Development in 2019 for HydroComp NavCad is focusing on increasing user efficiency and even greater improvements in prediction fidelity.

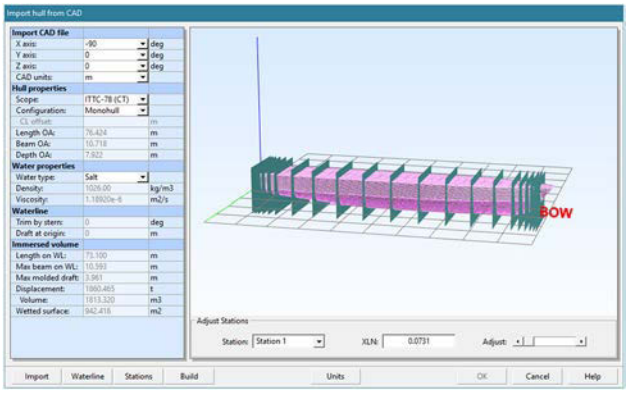
High-performance Propellers

Two new features for high-performance propellers have been developed for NavCad 2019 — prediction of "progressive pitch" propellers and a new model for surface-piercing propellers (SPPs). A "progressive pitch" propeller has a cambered propeller face. (The name comes from the added "progressions" of pitch from leading to trailing edge. This added camber changes the thrust and torque loading characteristics of a propeller.) The library series propellers such as Gawn or B-Series, however, are flat-faced propellers so the new prediction determines the increase in K_T and K_Q for a propeller's "face curvature ratio" (a new metric to quantify the added camber in a propeller). This will particularly benefit those evaluating outboard and stern-drive propellers, as well as contemporary propellers for high-speed craft.

The new SPP model offers NavCad users with a model for a five-bladed cleaver-style wedge-sectioned propeller (a four-bladed variant is in development.) HydroComp's in-house research also allowed for the development of a new performance metric for a "minimum critical speed", below which SPP propeller performance begins to fall off. This new design criterion can provide information to ensure that the vessel propulsor-drive system running an SPP has the proper gear ratio for the proposed speed and power.

Analytical Distributed Volume Method (ADVM)

HydroComp's powerful ADVM method has undergone additional updates to expand its scope to fuller vessels (such as workboats and full-form merchant vessels) and further improve its prediction accuracy. It also has a better predictor of the longitudinal contribution of a design's sectional area curve and beam distribution on wave-making resistance. This provides an even better tool for optimization of hull geometry where it is most effective and has the least demand on computational resources.



A screen shot of a CAD file imported into NavCad
(Image courtesy HydroComp)

Foil-assisted Asymmetric Planing Catamarans

A new extensive upgrade to the planing calculations in NavCad was completed in 2018. Building upon this new update, HydroComp staff had an opportunity to extend this work for fully-asymmetric (inner wall- sided) planing catamarans. A corresponding foil-assist prediction model uses a simplified definition of foil geometry (a planform area and center of effort) with a design lift fraction and foil lift-drag ratio for an easy-to-use evaluation of the potential benefits of foil-assistance.

CAD-to-NavCad pipeline

The "hull CAD import" utility introduced in 2018 has been improved for even faster operation and better data capture. Suitable for all vessel types, the module extracts all of the hull data necessary for predictions, including the ADVM method which employs the full hullform volume distribution.

Wärtsilä Hybrid Solution for Bulk Carriers

Wärtsilä has achieved a new technology benchmark with the introduction of the marine sector's first hybrid installation for a bulk carrier. This innovative system will be installed on MV *Paolo Topic*, a bulk carrier built at Onomichi Dockyard in Japan and managed by Marfin Management S.A.M. The project agreement was signed on 8 July in Monte Carlo, Monaco.

MV *Paolo Topic*
(Photo courtesy Wärtsilä.)

Wärtsilä's hybrid power module, the Wärtsilä HY, will ensure the seamless integration and control of the technologies to be installed with the ship's various existing power-production systems. This is made possible by the use of a dedicated energy management system (EMS) which will have overall control of the engines, batteries, power distribution and, for the first time in the maritime industry, solar panels to be installed on the weather deck.

"This new technology development, utilising a combination of engines, solar power and batteries, represents a milestone for the industry and is made possible by the Wärtsilä HY integration," said Giulio Tirelli, Director at Wärtsilä Marine Business. "Thanks to the fully-integrated solution, we are able to raise the bar in terms of economic competitiveness and environmental performance."

The integrated solution is expected to deliver a drastic reduction in fuel consumption and maintenance costs. This, combined with the highly-advanced level of environmental sustainability, will make *Paolo Topic* the global fleet's most technologically-advanced bulk carrier. Furthermore, operational stability and increased efficiency will be ensured in all operating conditions, including loading and unloading.

"We are pleased to have found like-minded partners to

bring new technology and innovative thinking onboard to help improve our environmental performance and leading the way towards a more sustainable future. We will be able to provide our customers and partners with the most advanced vessel performance and environmental quality without compromising on operational effectiveness and flexibility," said Alex Albertini, CEO at Marfin Management.

World's First Hydrogen-powered River Vessel

ABB is to provide a power and propulsion solution for a new vessel operating along the Rhône river in France to run entirely on hydrogen fuel cells

ABB has strengthened its position as the marine market's front runner on hydrogen fuel-cell technology through its role in FLAGSHIPS, the EU-funded initiative to deploy commercially-operated zero-emission vessels for inland and short sea operations.

Under this initiative, ABB will provide a fuel-cell-based power and propulsion solution for a new-build push boat for the France-based Sogestran Group subsidiary, Compagnie Fluviale de Transport (CFT), due for delivery in 2021. With hydrogen for the fuel cells sourced from shore-based renewable energy, the complete vessel energy chain will be emission-free.

An impression of the new hydrogen-powered push boat
(Image courtesy ABB)

"CFT has been an inland waterways innovator for more than half a century. Powering river transport in a sustainable way is a new type of challenge, but it has become vital that we cut emissions on Europe's inland waterways and, specifically, in the city centres. With this project, we aim to highlight that emission-free operation is both feasible and commercially viable," said Matthieu Blanc, COO at CFT.

"Taking an active role in the FLAGSHIPS initiative, ABB continues to push the boundaries of e-mobility in shipping," said Peter Terwiesch, President of the Industrial Automation business at ABB, which offers solutions for a wide range of industries, including marine. "As one of the world's leading enablers of sustainable transportation, ABB is committed to writing the future of the marine industry which will see vessels plying the world's waters more cleanly and efficiently."

As a FLAGSHIPS member since the project's start in January 2019, ABB has been working closely with Finnish research organisation and project coordinator, VTT, and the leading global provider of innovative clean energy fuel-cell solutions, Ballard Power Systems Europe, to develop an installation enabling a 400 kW fuel cell to power vessel operations.

The project objective is to demonstrate that fuel cells are a practical and deliverable propulsion solution for owners and builders of mid-sized vessels carrying more than 100 passengers or the equivalent freight volumes inland or coastally. For this reason, the scope of FLAGSHIPS also includes assessing the operational impact of the switch to hydrogen as a fuel.

Once the fuel-cell power plant has been fitted, the plan is to run the vessel daily, with special attention being paid to the refueling procedures needed to meet the operating schedule. Trials will therefore also provide insights into developing and optimising the refueling infrastructure needed for hydrogen fuel cells in marine operations.

With maritime transport estimated to emit around 940 Mt of CO_2 annually, there is an increased pressure for the shipping industry to deploy means of reducing harmful pollutants. The International Maritime Organisation adopted a strategy on reduction of greenhouse gas emissions from ships by at least 50% by 2050 compared to 2008, with the aim of phasing them out entirely.

Fuel-cell technology is widely considered as one of the most promising sustainable energy solutions for reducing marine emissions worldwide. Fuel cells turn the chemical energy from hydrogen into electricity through an electro-chemical reaction. They convert fuel directly to electricity, heat and clean water.

The FLAGSHIPS project is supported by the Fuel Cells and Hydrogen Joint Undertaking (FCH JU), a public-private partnership established under Europe's Horizon 2020 frameworks to accelerate commercial realisation of the technology in a range of transport and energy uses. The three members of FCH JU are the European Commission, fuel cell and hydrogen industries represented by Hydrogen Europe, and the research community represented by Hydrogen Europe Research. Parties involved in the CFT newbuild project also include LMG Marin, NCE Maritime CleanTech and PersEE.

Wärtsilä Offers the World's first Commercially-available Auto-docking System

Wärtsilä has taken a notable step towards realising the full commercial potential of autonomous vessels. Following the latest and most advanced testing of its SmartDock auto-docking system, which included giving industry representatives and customers first-hand experience as passengers onboard the test vessel, the company has secured the first order for the system. This makes SmartDock the world's first commercially-available auto-docking solution.

By automating docking procedures, the Wärtsilä SmartDock system mitigates potential human errors resulting from ship's officers having to perform these technical manoeuvres many times a day. This is especially

important on, for example, larger ferries which must enter and leave tight docking spaces, where significant damage can be caused by forceful collisions with the dock walls. Efficiency and safety is, therefore, considerably increased.

The ship's master can select the destination and with a simple click of the 'sail' button, the SmartDock system takes over. The ship then leaves the dock, manoeuvres out of the harbour, sails to the next port of call, manoeuvres into the harbour and docks alongside the quay, all without human intervention.

"The SmartDock solution is the culmination of decades of extensive research and testing by Wärtsilä in automation technology. Our system draws on similar automation and positioning technology used by oil rig support vessels to maintain proximity to the rig in the toughest sea environments. This gives us absolute confidence in SmartDock's ability to meet the urgent commercial need to provide the safest possible docking for commuter ferries," said Joonas Makkonen, Vice President, Voyage Solutions, Wärtsilä.

The successful sea trials were carried out onboard *Folgefonn*, an 85 m long ferry owned by Norwegian operator Norled. The testing also included operating the automatic 180-degree rotational turn of the vessel, as well as Wärtsilä Guidance Marine's CyScan AS with GeoLock technology, a crucial cyber-security enhancing secondary position sensor, which enables the approach to the berth to continue even if the GPS signal is lost.

"We continue to be impressed with the Wärtsilä SmartDock system, which is unique in that it works hand-in-hand with the ship's master to ensure the best performance on every docking, every day. It's the perfect collaboration between an experienced crew and technology," said Inge Andre Utåker, Regional Director, Norled.

Successful advanced testing of the Wärtsilä SmartDock solution was completed over a four-day period onboard *Folgefonn* (Photo courtesy Wärtsilä)

Diverless Sea-chest Blanking Achieved

Intervention Engineering (IE) has recently successfully installed a number of FPSO sea-chest blanks using mini-ROVs allowing the vessel engineers to swap out shipside valves. The largest blanks installed measured 1450 × 950 mm and weighed in at 195 kg.

Operating from on board the FPSO during normal operations, IE's three-man team conducted cleaning of the intakes and surrounds before deploying and installing blanks. IE's innovative installation solution utilised the existing vessel sea-chest blanks, installation aids enabling accurate pull-in, alignment and positive locking of the blanks.

Using mini-ROVs for sea-chest blank installation minimises risk by eliminating diving. Other benefits include shorter lead times, lower personnel numbers and minimal impact on day-to-day operations.

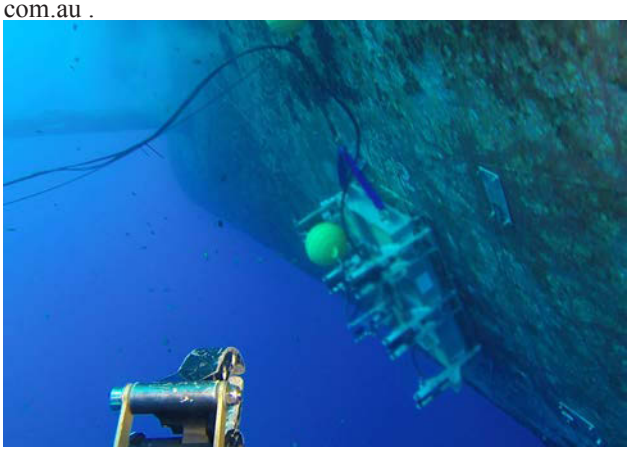
Diverless sea-chest blanking adds to the extensive list of FPSO services offered by Intervention Engineering including UWILD/IWS for class, cleaning (hull, risers and chains), chain measurement and tank inspection.

Intervention Engineering's Managing Director, Stuart Barrow, stated "I am extremely proud of this achievement and the benefits which it brings to our industry. This complements our existing FPSO services giving our clients an easier and safer option for shipside valve changeout."

Intervention Engineering is a Perth-based ROV Solution Provider, with a demonstrated track record of innovative vessel solutions including:

- Ballast/Cargo Tank Inspections (2006)
- Diverless UWILD (2007)
- Hull Inspection on DP (2010)
- 3D Chain Measurement (2015)
- Diverless UWILD for Self-propelled Vessel (2015)
- Shipside Valve Plugging (2017)
- Riser Clamp Installation (2018)
- Seachest Blank Installation (2019)

For more information contact Intervention Engineering on (08) 6162 2559 or visit the website www.intervention.com.au .



Diverless sea-chest blanking (Photo courtesy Stuart Barrow)

A blank about to be deployed (Photo courtesy Stuart Barrow)

Better AMSA Data Means Safer Vessels

The experience of the Australian Maritime Safety Authority (AMSA) with ship safety tells us that incident reporting is the currency of safety — an excellent safety culture depends on a positive reporting culture. The data which we obtain from vessels involved in a marine incident or near-miss is critical for us as regulators to identify risks and put measures in place to maximise safety.

There's a clear trend emerging from the incident data which AMSA collates. While we're receiving more incident reports across the board, we are seeing proportionately fewer incidents of a 'serious' or 'very serious' nature. Also, our most recent report on foreign-ship inspections shows that there has been a reduction in deficiencies and detentions, despite AMSA receiving an increasing number of incident reports. This is encouraging because it shows that, as the industry's safety culture matures, operators are more likely to report incidents and, importantly, help build our knowledge base in the process. I am buoyed by the cultural shift in reporting attitudes because, if knowledge is power, then information is our strength.

As the depth and reliability of the data improves, we have the opportunity to use that knowledge and data to better inform our decisions, and design our intervention programs. For AMSA that can mean which ships we target for inspection, where we locate our aids to navigation, or where we need emergency towing capability.

The increase in access to reliable incident data also presents an opportunity for vessel designers to use that data to inform future designs and innovative solutions. The term 'learning culture' aptly describes the combination of action by designers and owners to draw appropriate conclusions from analysis of the data and, hence, desire to implement changes to new vessels in ways which minimise system-provoking errors. If vessel designers are able to identify a change in design which mitigates or eliminates a risk observed in incident data, then this would be far more effective in increasing safety than addressing that risk by means of procedure or additional equipment mandated by regulators.

The consistency of our historical data in the domestic sector is poor and, in the Australian commercial vessel fleet, a culture of under-reporting remains prevalent. As we enter our second year of delivering services under the National System for Domestic Commercial Vessel Safety, we know that more needs to be done to improve the safety culture across the domestic sector. For example, it is unacceptable that, in the past five years, a total of 24 workers in the fishing industry have lost their lives on the job.

We do gather data from 'very serious' or 'high consequence' accidents and subsequent investigations. These experiences are, however, not enough to provide us with the depth of information which we need on the safety issues across the domestic fleet. We need to make it easier for operators to report incidents and near misses. We need to work together to improve reporting. We have responded to calls for a simpler design of the incident report form and this is already improving the quality of the data which we collect.

We know we've been missing opportunities to understand some of the underpinning behaviours that are commonly present in incidents. We are responding by working with industry and our research partners on how we counter the fear of investigation and blame culture, and encourage industry to share their experiences.

On the back of research, with the likes of the Fisheries Research and Development Corporation, the University of Queensland and Curtin University, AMSA is developing intervention strategies directed at systems and processes—as well as people. We recognise that language barriers are also an impediment to reporting, as are time restrictions and other factors such as technology and communications and a lack of clarity about responsibility.

To make real safety gains we must have good data upon which to base intervention before serious incidents occur. Encouraging near-miss reporting and including those 'lessons learned' in detailed analyses will also improve safety performance.

We must also ensure that, as our data improves, it is shared widely with vessel designers, builders, operators and anyone with an interest in maritime safety. Vessel designers particularly may find novel ways to apply incident data which could lead to new designs which may improve safety and efficiency while also adding value to their work.

Minimum safety standards are only the starting point, the line in the sand which we all agree will not be crossed. For the best outcomes, we must not design for the minimum but aim higher, and data could be the key. AMSA will continue to strive to raise the domestic maritime safety culture through policy decisions, guidance and education.

We understand how to improve safety, for shipping and for domestic commercial vessels, and AMSA will do more to improve the safety culture across the domestic commercial sector by focusing on system concepts, and prioritising human error as a consequence — rather than solely as a cause — of failures.

Mick Kinley
CEO Australian Maritime Safety Authority

MEMBERSHIP

Australian Division Council

The Council of the Australian Division of RINA met on the afternoon of Tuesday 18 June 2019 by teleconference under the chairmanship of our President, Prof. Martin Renilson, in Launceston with phone links to Cairns, Gold Coast, Sydney, Canberra and Perth.

This meeting, being the first following the Division's Annual General Meeting, had a full agenda including many on-going items. Some of the more significant matters raised or discussed were:

New Member of Council

Council welcomed Jason Steward, who had been appointed inter-sessionally.

Section Coordinators for Social Media and Advertising in "*The ANA*"

This matter remains outstanding and Sections are requested to notify the Secretary of the names of their respective appointees. It remains the responsibility of all members to pursue prospective advertisers to ensure the continued publication of our journal, which most will agree to be an outstanding feature of the Division's activity.

AMSA Liaison re Domestic Commercial Vessels

Following the formation of a Working Group of members with wide-ranging interests in this subject in accordance with the decisions of the previous meeting, Council tasked the Group with development of issues and communicating with AMSA on those issues.

Naval Architecture Career Flyer

Council signed off on the content of the updated flyer and its printing, together with in-principle discussions on its distribution. Pending availability of hard copies, the flyer can be found at https://www.rina.org.uk/res/Careers%20in%20NA%20Australia.pdf .

Walter Atkinson Award 2019

Since nominations for the Award were due to close in mid-July, Council put arrangements in place for evaluation of the nominated papers.

Naval Shipbuilding

Council noted that the Institution had been formally included in consultations regarding the Naval Shipbuilding College and was excluded from membership of the associated Naval Shipbuilding Industry Reference Committee. Accordingly, strategic documents obtained in relation to the personnel for implementation of the Naval Shipbuilding Plan appeared to have been prepared without appropriate knowledge of the role of naval architects and maritime engineers in all aspects of ship construction, commissioning and sustainment, not only design. Council therefore authorised letters to the relevant Defence Ministers and the Director-General of Naval Engineering to bring attention to the contribution that the Division could and should make to establishment of the framework for implementation of the Plan.

Next Meeting of Division Council

The next meeting is tentatively scheduled for the afternoon of Tuesday 19 September 2019.

The draft minutes of the meeting are available to Council members on the Council forum and are available to other members by request to the Secretary.

Rob Gehling
Secretary
ausdiv@rina.org.uk
Phone 0403 221 631

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 year. 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 Council

President	Martin Renilson
Vice-president	Gordon MacDonald
Secretary	Rob Gehling
Treasurer	Craig Boulton

Members nominated by Sections

Adrian Broadbent (NSW)
Peter Dandy (SA&NT)
Ian Laverock (ACT)
Kalevi Savolainen (WA)
Karl Slater (Vic)
Cameron Whitten (Qld)
Michael Woodward (Tas)

Members elected or appointed by Council

Walid Amin
Jonathan Binns
Jim Black
David Gonzales Pastor
Violetta Grabovska
Gordon MacDonald
Jason Steward

ACT Section

Chair	Ray Duggan
Deputy Chair	Joe Cole
Secretary	Alistair Smith
Assistant Secretary	Dylan van Drunen
Treasurer	Kristoffer Grande
Nominee to ADC	Ian Laverock
Members	Guy Anderson
	Peter Hayes
	Warren Smith

NSW Section

Chair	Valerio Corniani
Deputy Chair	Phil Helmore
Secretary	Jason Steward
Treasurer	Adrian Broadbent
Nominee to ADC	Adrian Broadbent
Auditor	David Wong
TM Coordinator	Phil Helmore
Members	Craig Boulton
	Alan Taylor
	Rob Tulk

Queensland Section

Chair	Tommy Ericson
Deputy Chair	Peter Holmes
Secretary	Hamish Lyons
Treasurer	James Stephen
Nominee to ADC	Cameron Whitten
Members	Gerald Anton
	Steve Grogan
	Sasha Harrison
	Tom Pipon
	Tim Vaughan
	Ashley Weir

South Australia and Northern Territory Section

Chair	Peter Dandy
Deputy Chair	Nathan Doyle
Secretary	Nicholas Clark
Treasurer	Haico van der Werf
Nominee to ADC	Peter Dandy
Members	Phil Bevan
	Eric Fusil
	Giang Ngo
	John Peel
	Peter Samarzia

Tasmania Section

Chair	Nick Johnson
Deputy Chair	Jonathan Binns
Secretary	Brian Winship
Treasurer	Daniel Clayton
Nominee to ADC	Michael Woodward
TM Coordinator	Jonathan Binns
Members	Jack Davison
	Zhi Leong
	Gregor Macfarlane
	Tom Mitchell-Ferguson
	Alan Muir
	Elisha Riley
	Greg Swalwell

Victoria Section

Chair	Jesse Millar
Secretary	Owen Tregenza
Treasurer	Tom Dearling
Nominee to ADC	Karl Slater
Members	Jon Emonson
	James Nolan
	Luke Shields
	Nathan Wallace

Western Australia Section

Chair	Sammar Abbas
Deputy Chair	Kenneth Goh
Secretary	Matthew White
Treasurer	Cheslav Balash
Nominee to ADC	Kalevi Savolainen
Member	Nathan Chappell
	Tim Gourlay
	Ian Milne
	Gino Parisella
	Andy Phillips
	Poitr Sujkowski
	Jinzha Xia

International Journal of Small Craft Technology

Editor	Martin Renilson
Editorial Board Member	Phil Helmore

The Australian Naval Architect

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

Walter Atkinson Award Committee

Chair	Karl Slater
Members	Alan Muir
	Mike Squires

RINA London

Council Members	Martin Renilson (*ex officio*)
	Rob Gehling
Maritime Safety Committee	
	Rob Gehling
	Doug Matchett
High-speed Vessels Group	
	Tony Armstrong

RINA/Engineers Australia Joint Board of Naval Architecture

Members	Rob Gehling
	Gordon MacDonald

National Engineering Register Naval Architecture Competency Panel

In recess

AMSA DCV Liaison Working Group

Members	TBA

Standards Australia Committee CS114 (Small Pleasure Boats)

Mark Devereaux

Standards Australia Committee ME059 (Shipbuilding)

David Gonzalez Pastor

IMC2019 Organising Committee

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

IMC2019 Program Committee

Chair	Adrian Broadbent
Members	Craig Boulton
	Robin Gehling
	Ganga Prusty
	Martin Renilson
	Karl Slater
	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 Div.	rina.austdiv@optusnet.com.au
Section	
ACT	rinaact@gmail.com
NSW	rinansw@gmail.com
Qld	hamish.lyons@oceanicdesign.com.au
SA/NT	rinasantdiv@gmail.com
Tas	brian.winship@utas.edu.au
Vic	owen.tregenza@dst.defence.gov.au
WA	wa@rina.org.uk

Phil Helmore

THE INTERNET

Victorian Section Webcasts

The Victorian Section has been recording their technical presentations, and now has the website up and running on YouTube for their webcasts, see https://www.youtube.com/channel/UCgTvKDy3efXQrMjvBAy-fDQ.

These webcasts are also linked from the RINA Australian Division website by clicking on Technical Presentations in the box for Australian Division Links on the home page, see https://www.rina.org.uk/Technical_Presentations.html.

Those recorded and now available are:

- *Some Principles for Updating IMO's High Speed Craft Code*, presented by Rob Gehling from the Royal Institution of Naval Architects on 14 March 2018 at BMT Screen recorder proDesign & Technology in Melbourne.
- *A New Lease of Life for Sydney's Iconic Floating Dock*, presented by Sean Langman, Managing Director, and Belinda Tayler, General Manager Defence and Commercial, from Noakes Group on 19 April 2018 at BMT Design & Technology in Melbourne.
- *Reducing the Vulnerability of Maritime Platforms to Underwater Weapon Attack*, presented by Warren Reid from the Maritime Platforms Division at DST Group on 21 June 2018 at the Mission to Seafarers in Docklands.
- *Submarines, Space (X) and Star Trek: Same Story?*, presented by Eric Fusil, Director from Odyssee Aus and Director of the Shipbuilding Hub for Integrated Engineering and Local Design from the University of Adelaide on 13 September 2018 at the Mission to Seafarers in Docklands.
- Domestic Commercial Vessel Survey in Australia — The changes in Regulation and Privatisation of Survey, presented by James Nolan, AMSA-Accredited Marine Surveyor from Maritime Survey Australia on 13 December at the Mission to Seafarers in Docklands.

Further recordings will be added as they occur. Bookmark the site and watch this space!

Jesse Millar

NSW Section Webcasts

The NSW Section has downloaded and used the *Screen Recorder Pro* freeware to a laptop computer for recording of technical presentations. This software combines the PowerPoint or Acrobat slides with the presenter's audio and produces an MP4 file which can then be uploaded to the web for later viewing.

It is expected that this software will be trialled on upcoming presentations, the webcasts will then be uploaded directy to the RINA Australian Division website, where you click on Technical Presentations in the box for Australian Division Links on the home page, see

https://www.rina.org.uk/Technical_Presentations.html.

Phil Helmore

NAVAL ARCHITECTS ON THE MOVE

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

Toby Austin-Fraser moved on within the Maersk group in 2016 and took up the position of Naval Architect with Maersk Fleet Management & Technology in Copenhagen, Denmark.

Tom Bromhead moved on from MPC Kinetic in 2015 and, after some time at Solstad Farstad and completing his Deck Watchkeeper's certification at the AMC, has now taken up the position of Third Officer with Toll Shipping in Adelaide/Bass Strait.

Greg Carmody has moved on from Australian Superyachts and has taken up the position of Assistant Program Manager with Dowse Projects in Canberra.

Levi Catton has moved on from Irving Shipbuilding and has taken up the position of Program Director/SEA5000 Technical Advisor Ship Integration with Gibbs & Cox Australia in Canberra.

Li Chen has moved on from Austal Ships and has taken up the position of Naval Architect with the Domestic Commercial Vessels Safety Unit of NSW Roads and Maritime Services in Sydney.

James Fenning has moved on within the Sapura group and has taken up the position of Operations Manager with Sapura Energy Australia in Perth.

David Firth moved on from Chemstore International Group in 2016 and took up the position of Engineering Manager with Composite Consulting Group in Sydney.

Anthony Gray moved on from Austal Ships in 2007 and, after some time at Babcock International Group—Marine Division, has taken up the position of Technical Manager/Naval Architect with OSD-IMT in Bideford, UK.

Adela Greenbaum has moved on from the Department of Human Services and has taken up the position of Assistant Research Director with the Sea Power Centre–Australia in Canberra.

Pranjal Gupta moved on from BT Financial Group in 2017 and, after some time at BlueInc Group, has taken up the position of Home Loan Professional with Unisys in Sydney.

Gaspar Gusvany moved on from DST Group in 2006 and, after some time at GL Noble Denton, Lloyd's Register and Atkins, has taken up the position of Senior Structural Engineer with BAE Systems in Glasgow.

Tim Hall has moved on within Lloyd's Register and has taken up the position of Lead Consultant—Marine in Sydney.

Matthew Harman has moved on from BAE Systems and has taken up the position of General Design Lead with Navantia Australia in Melbourne.

Edward Hawkins has moved on from One2three Naval Architects and has taken up the position of Graduate Adviser with Australian Energy Market Commission in Sydney.

Nigel Hay-Smith has moved on within the Aus Ships Group and has taken up the position of Senior Naval Architect in Brisbane.

Yasuhiro Hayashi continues as a naval architect with Japan Marine United Corporation in Hiroshima, Japan.

John Hayes continues as Operations Engineer with Subsea 7 in Perth.

Sam Henson moved on from One2three Naval Architects many moons ago and has taken up the position of Manager with Botany Timber in Sydney.

Craig Hughes has moved on from American Bureau of Shipping and has taken up the position of Managing Director with Grabail in Perth.

Mark Hughes has moved on from Saudi Aramco and is now consulting in Melbourne.

Jun Ikeda moved on from Technip in 2016 and, after some time at Sea Trucks Group and TechnipFMC, has taken up the position of Subsea Engineer with Trident Energy in Bata, Equatorial Guinea.

Graham Jacob moved on from London Offshore Consultants in 2016 and, after some time at Linkforce Engineering, has taken up a position as a Naval Architect with Orwell Offshore in Ipswich, UK.

Ruth Jago has moved on from Petrovietnam Technical Services Corporation and has returned to BW Offshore where she has taken up the position of Project Assurance Manager in Singapore.

Alli (Alan) Jani moved on from Deniz Ship Design and Service in 2017 and has taken up the position of Naval Architect with Lightning Naval Architecture in Sydney.

Andrew Jeffs continues as a marketing consultant in Fremantle, now providing services to International Maritime Consultants and Dongara Marine.

Judith Kennedy moved on within ASC in 2016 and took up the position of Production Engineering Manager in Adelaide.

Chia How Khee has moved on from Henry Schein and has taken up the position of Compliance Manager with Consort Bunkers in Singapore.

Anthony Livanos has moved on within Austal Ships and has now taken up the position of Design Manager in Cebu, Philililpines.

Teresa Lloyd moved on from Port Hedland Port Authority in 2003 and joined Maritime Industry Australia where she has now taken up the position of Chief Executive in Melbourne.

Dan Mace continues as Technical Manager with Incat Crowther in Sydney.

Georgia McLinden has moved on from One2three Naval Architects and has taken up the position of Methods and Tools Engineer (a transfer-of-technology role for the submarine project) with Naval Group in Cherbourg, France.

Warwick Malinowski continues as Principal Naval Architect with Rolls-Royce Australia Services in Sydney.

John Manning has moved on from Worley Parsons and has taken up the position of Managing Director with Ship & Offshore in Melbourne.

Brett Morris has moved on within the Defence Science and Technology Group where he has now taken up the position of Naval Architect and Systems Engineer in Melbourne.

Simon Orr has moved on from Cecon Contracting and

has taken up the position of Project Manager with Blom Maritime in Oslo, Norway.

Shaun Phelps moved on from Sea Transport Solutions in 2016 and, after some time at Riverside Marine Services, has taken up the position of Director/Project Naval Architect with Periscope Naval Architects in Brisbane.

Brocque Preece continues his current position of Naval Architect Ports and Harbours, but Braemar Shipping has been acquired by Australis and the company is now known as AqualisBraemar, and Brocque has moved from New York back to London, UK.

Kristofer Rettke has moved on within the Capability, Acquisition and Sustainment Group and has taken up the position of Diving and Hyperbaric In-service Support Manager in Sydney.

Alex Robbins has moved on and, in addition to continuing as Engineering Manager for the MATV, MV *Sycamore,* has also taken up the position of Engineering Manager for HMAS *Choules* in Sydney.

Peter Roberts continues as Director with Navatech, and has also taken up the position of Proprietor with Finch Restorations, Australia's oldest vehicle restoration firm, in Adelaide.

David Sherwood continues consulting as Sherwood Marine Design in Fremantle.

Merdan Solak has moved on from Registro Italiano Navale in Hamburg and returned to Brisbane, where he has set up his own company, Sea Waterline, carrying out condition, damage and sale surveys and independent superintendent services for worldwide clients, and flag-state inspections on behalf of Isle of Man and Cayman Islands ship registers in Australasia.

Paul Steinman continues consulting as Halcyon International and has also taken up the position of Product Manager—VEEM Gyro with VEEM in Perth.

Samantha Tait continues as Managing Director of her own consultancy, Tusk Engineering, and has also taken up the position of Technical Director with Systematiq in Melbourne.

Alistair Verth has moved on from Anode Engineering and has taken up the position of Corrosion Engineer with Corrosion Control Engineering in Brisbane.

Ramesh Watson moved on from Evapco in 2018 and, after a year at OEM Technology Solutions, has taken up the position of Structural Engineer with Arcadis Australia Pacific in Sydney.

Adam Williams has moved on within DNV GL and has taken up the position of Plan Approval Group Leader in Sydney.

David Wise-Mann has moved on from London Offshore Consultants and has taken up the position of Naval Architect and Marine Surveyor with Maritime Survey Australia in Sydney.

Ivy Zhang continues as Design Engineer in the Marine Department with Premier Composite Technologies in Dubai, United Arab Emirates.t

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

HMAS *Sirius* and HMAS *Hobart* undertaking a replenishment-at-sea exercise off the NSW coast recently (RAN photograph)

FROM THE ARCHIVES

The Chilean Navy's sail training ship, the barquentine Esmeralda, has been a regular visitor to Sydney.
Here she is seen departing from Sydney on 24 June 2012 during one of her training cruises
(Photo John Jeremy)

The Chilean Navy's barquentine *Esmeralda* arriving at Fleet Base East on 1 August for a four-day visit to Sydney as part of her 2019 Pacific training cruise
(RAN photograph)