THE AUSTRALIAN NAVAL ARCHITECT

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Australia's largest capacity high-speed lobster boat, the 25.75 m *Holdfast*, recently completed by Dongara Marine in Western Australia
(Photo courtesy Dongara Marine)

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Cover Photo:

NUSHIP *Brisbane* during recent sea trials off Adelaide

(Photo courtesy AWD Alliance)

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From the Division President

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

First I'd like to thank the Victorian Section for hosting the AGM this year, and of course BMT for providing the venue. Thanks also to Rob Gehling, who gave a very interesting technical presentation entitled *Some Principles for Updating IMO's High-speed Craft Code*. This attracted quite a number of members, ensuring far more that the required quorum for the AGM.

In addition, the Victorian Section held a subsequent technical presentation entitled *A New Lease of Life for Sydney's Iconic Dock* by Sean Langman and Belinda Tayler. Both presentations were recorded and can be viewed on YouTube (*links are available on p. 51* — Ed.). Thanks to Jesse Millar for organising the recording of both of these.

I am really keen to hear whether members find the recorded technical presentations interesting, or not, and any feedback on how we can improve them. The recent survey of members showed that there was a strong demand to be able to access presentations on-line. We tried this many years ago (with the NSW Section) but it was quite expensive and didn't seem to work very well. However technology has moved on, so I'm optimistic that it will be successful now. If we do get positive feedback from members then we can extend this to technical presentations at other sections.

As an aside, my wife recently attended a concert in Devonport, Tasmania, which had been recorded live from a performance in Sydney. The venue used an Imax cinema, with very good sound, and she said that it was almost like being there. If we can achieve this sort of result for our section technical meetings then that will be quite a step forward, and will allow members who are not normally able to attend section meeting to benefit from the presentations.

Perhaps a section can organise a technical meeting comprising a video recording of a presentation which had been held at a different section. When I lived in the UK, I did attend one such presentation which was a video recording, as the speaker wasn't able to attend. This gave the members the opportunity for a networking occasion, together with an interesting presentation, albeit without the presenter. There was still the opportunity for discussion after the presentation. Although the presenter was not there to reply, it was still a very interesting evening.

At the other end of the spectrum, I recently attended a networking breakfast held by Engineers Australia. There was a brief and very interesting presentation, but it was quite informal, and the main purpose of the event was networking, rather than just the technical presentation. However, members of EA were given a one-hour credit towards their CPD! Perhaps sections ought to consider whether networking breakfasts would be a good idea for them?

Another very interesting development is our eNewsletter. This is a very brief update which will come to members on a monthly basis. One of the aims of this newsletter is to publicise section technical meetings in advance. Another of the outcomes of the survey of members was that many said that they'd like to attend section technical meetings in other states when they're travelling. This newsletter will make members aware of when such meetings are being held. Of course, this is only going to be as good as the information that section secretaries contribute to it. Other snippets of news are also very welcome. Thanks to Jesse Millar for all his work in getting this going.

Martin Renilson

Developments are ongoing regarding the Single National Jurisdiction, and I have mentioned before that the Division has established a committee to liaise with AMSA. We have been in regular communication with AMSA, and I have just written to the CEO about a number of specific topics, including feedback on the way that the new system is working. We made the strong point that, although there are still some problems, we feel that the situation regarding commercial vessels is improving and we appreciate the efforts which are being made by AMSA in this regard. However, we are trying to show where we feel that improvements can be made, and are offering to help where possible. If members have any comments on the way that this is progressing, then please do let us know.

It is good news that the Naval Shipbuilding College is now due to get underway. The Institution has been saying for a number of years that the country needs naval architects at the para-professional level, and hopefully this will be addressed by the College. We finally received a response from Minister Pyne, who said that he has asked the Department of Defence to arrange for the successful tenderer to liaise with the Institution.

On that note, it is interesting to see that the *Defence Industrial Capability Plan* has been launched. At first glance, this looks like it is good news for the naval sector, with two of the initial ten sovereign industrial capability priorities being the Collins-class submarine maintenance and technology upgrade and the continuous shipbuilding program. It is also interesting to note that this document mentions that the first annual update of the Naval Shipbuilding Plan will be released in mid-2018.

As many members will be aware, at the Australian Division AGM, the proposed changes to the by-laws and guidelines regarding the way the Division is run and, in particular, the way the sections are funded, were agreed. These changes were also approved at the recent Council meeting in London.

Finally, I am very pleased to see that the two sections which have been least active in the recent past, the Tasmanian Section and the South Australian/Northern Territory Section, have now become much more active. I have attended a couple of technical meetings of the Tasmanian Section this year and I am planning to attend the South Australian/Northern Territory Section technical meeting in May. Both sections are holding their meetings on University premises, which I hope will encourage students to attend. This is important, as students are the future of our profession and, of course, of our Institution. Perhaps we ought to give more thought to the encouragement of students into both the profession and the Institution, but that is a topic for a future discussion.

I hope that you enjoy this edition of *The Australian Naval Architect*.

Martin Renilson
President

Editorial

The Commonwealth Government recently released the 2018 *Defence Industrial Capability Plan*. It is one of the most comprehensive statements of the role which industry must play in supporting the Australian Defence Force which has been developed for many years. It emphasises the need for Australia to have a strong, more resilient and internationally-competitive Defence Industry working in partnership with Defence. It sets out a number of Sovereign Industrial Capability Priorities to be focussed on in coming years. Top of the list are the Collins-class submarine maintenance and technology upgrade and the continuous shipbuilding program (including rolling submarine acquisition). With regard to the latter the Plan states that "Australian industry must have the technical, managerial, heavy-engineering and advanced-manufacturing capabilities required to build an innovative, cost-competitive, sustainable and continuous program which delivers Australia's future submarines, major surface combatants and minor war vessels."

Whilst this statement is straightforward, the reasons why we *must* have that capability are not well understood by many people. By maintaining these shipbuilding capabilities within Australia's industry, we maintain the capability to independently support and modernise our ships and submarines. In the longer term we must also develop a capability to design our own ships, recognising that the design of modern warships is, in most cases, a task which brings together international resources. There are few nations which have the national capacity to do it all, the United States being an example. Even there, the future US Navy will have ships with international technology (including Australian) and their shipyards have strong international links and sometimes ownership.

In launching the *Defence Industrial Capability Plan*, the Minister for Defence Industry stated "an Australian Defence Company having an ABN and a shopfront is no longer enough — we want to see Australian leadership, an Australian board, and an Australian workforce value-adding right here at home." As I write this, Centre Alliance Senator Rex Patrick is planning to introduce a bill to the Senate which would require all new naval vessels exceeding 30 m to be built in in Australia except in in times of defence emergency or in wartime. Moreover, Australian shipbuilders building future naval vessels could not be a subsidiary of a foreign entity.

Whilst we may agree with the spirit of Senator Patrick's proposals, his bill might be going too far. There is often much to be gained from the international links which can arise from the membership of a large international group, Australian or foreign owned. New markets can become available and opportunities for Australian participation in international projects can be fostered. The important thing to achieve is Australian know-how and expertise in those capabilities which are important for our self-reliance and independence.

Self-reliance requires more than just the assembly of ships in shipyards. It includes the capability to integrate the ship's equipment and services with the payload, the warship's combat system. Whilst selections have been made for the combat system suppliers for our new ships and submarines, and much of the required work will be undertaken in Australia, not all the elements of the resulting equipment will be Australian in origin. Similarly, a range of machinery and equipment for the vessels may be made in Australia but much is likely to be the same as that fitted to other ships throughout the world. It is the ability to integrate such equipment into the ships, to support it throughout its life and adapt it to our needs which is the most important.

Recent announcements by the Government of major equipment selections, ranging from offshore patrol vessels to armoured vehicles, have emphasised that they will be 'built in Australia from Australian steel.' There is, of course, nothing wrong with sourcing the steel from Australian mills, indeed it is to be encouraged, but such statements can be misleading and suggest that purchase of this steel in Australia is both strategically important and of great value to the sustainment of the Australian steel industry. In fact, the amount of steel required for the frigates, submarines and offshore patrol vessels is relatively modest and will represent a tiny proportion of the output of Australian suppliers. Steel for ships and submarines (particularly the latter) is often specialised and it is desirable, and quite practicable, to purchase sufficient quantities from the outset to support the vessels throughout their life, as we have done in the past for submarines bought overseas, for example.

If we can, then by all means buy Australian steel, but let us not be diverted from the reality that it is the development and sustainment of Australian skills in ship design, system and weapons integration and software development which are the strategically-important priorities. We achieve that aim by maximising the input of Australians into the design and construction of our ships, as far as practicable in Australia.

John Jeremy

LETTER TO THE EDITOR

Dear Sir,

We are all transitioning and living in a new era where everything is becoming automated, and the maritime sector is not falling behind in this matter.

"Smart ships" are becoming a real thing, says World Maritime News in an interview with Oskar Levander, Vice-President of Innovation Marine at Rolls-Royce. The technology needed to make remote and autonomous ships exists, and vessels' 'virtual captains' are not far away. A ship's ability to monitor its own health, establish and communicate what is around it, and make decisions based on that information, are vital to the development of autonomous operations.

According to a report published by insurance company Allianz in 2012, between 75 and 96 percent of marine accidents are the result of human error, often as a result of fatigue.

This concept of "smart ships" would change the design and operation of ships on a large scale, increasing the cargo capacity and hydrodynamics, while reducing wind resistance.

With no crew to accommodate on this type of ship, the deckhouse, crew accommodation, and elements of ventilation, heating and sewage systems can be removed, making the ship lighter, cutting energy and fuel consumption, reducing operating and construction costs, and facilitating new designs. As a consequence of autonomous cargo vessels, the transportation costs can be reduced by approximately 20%. Intelligent ships are also a solution to the growing maritime skills shortage due to increased system complexity.

Fewer people want to spend weeks away from home and family, and autonomous ships could transfer the seafaring jobs from the sea to remote operations centres on land, making it more attractive for young people to join the industry.

The world of naval architecture is wonderful due to this kind of innovation, and every day I'm more sure that, at UNSW, I'm on the right track to grow as a person and a professional in the maritime world.

Gianluca Viluce Correa
UNSW Student

HMAS *Hobart* leading NUSHIP *Brisbane* to sea from Adelaide in early April.

The destroyers have been testing the Cooperative Engagement Capability, which combines radar and fire-control data into a common picture, allowing one ship to engage an adversary based on the other ship's data. Cooperative Engagement Capability is one technology which will form a part of the Australian Joint Integrated Fires Capability being implemented in the Australian Defence Force. It was the first use of this cutting-edge technology by a nation outside the United States.

The Cooperative Engagement Capability will also be integrated into the future frigate's Aegis combat management system together with the Saab Australia developed interface and the Australian CEAFAR phased-array radar
(Photo courtesy AWD Alliance)

COMING EVENTS

NSW Section

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 for 2018 (with exceptions noted) is as follows:

6 Jun	Bernard O'Shea, Design Manager, Silver Yachts *Design and Construction of Silver Yachts*
4 Jul	CMDR Alastair Cooper, Royal Australian Navy *Upgrade or Replace: A Cost Comparison of Australian Warship Service*
1 Aug	IMarEST
5 Sep	IMarEST
3 Oct	Valerio Corniani, Global Marine Segment Manager, Diab *Composite Superstructures on Car Carriers* Royal Prince Alfred Yacht Club, 160 Wolseley Rd, Point Piper
6 Dec	SMIX Bash 2018

Basic Dry Dock Training Course

DM Consulting's Basic Dry Dock Training is a four-day course which covers the fundamentals and calculations of dry docking. The next courses in Australia will be held on 30 October–2 November 2018; location and 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.

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

Topics to be covered include:

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

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.

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

The ACT Section has hosted some interesting presentations in recent months.

On 21 February 2018, Matt Roberts from BMT Defence Services gave a presentation entitled *BMT Submarine Design Portfolio*. The meeting was attended by 19 members and guests.

Matt's talk covered four submarine designs which BMT Defence Services had developed over the period 2004–17. Matt gave a highly entertaining and interesting talk which explained the reasoning behind undertaking the design activities (which were not for clients and, in general, were not intended to produce designs to be built), the decision process behind the submarine requirements, and some of the unique or interesting features of each design.

SSGT (Ship Submersible Gas Turbine) was developed primarily to foster discussion around innovative submarine propulsion arrangements. The submarine was intended to have "the approach and mobility of SSNs whilst retaining the advantages of the SSK" (to quote BMT). It achieved this by having two gas turbine-alternator sets installed at the top of the fin, to produce electrical power for transits. These produce sufficient power for the submarine to transit at 20 kn with just the top of the fin and the masts above the sea surface. The submarine can then submerge and operate on fuel cells for up to 25 days in covert mode. In order to enable the transits submerged but in close proximity to the surface, the SSGT has an innovative pear-shaped cross section, to reduce induced motions from surface waves.

Vidar 36 was designed as a conventional, air-independent-propulsion-powered submarine, intended to fit at the top end of the market for conventional submarines. One of the primary purposes of this design exercise was to give experience to a relatively new design team and to refresh BMT's internal design tools. The design included a range of features to improve the survivability of the submarine.

Vidar 7 (developed five years after Vidar 36) was initiated because there was, again, a relatively new design team and the intent was to demonstrate their capabilities. The design requirements were selected on the thinking that, over the decades since 1960, submarine displacements have only increased as the proven builders have evolved their designs. The assessment was made that there was no conventional submarine of less than 1000 t displacement, which could be suitable for a country looking to operate submarines for the first time. The design team therefore developed a sub-1000 t reasonably-capable submarine. There were some notable compromises necessary to enable the design to 'work', such as external pressure-hull frames, the omission of an escape tower, and the omission of a bow sonar.

Wyvern (developed in 2017) was initiated with the same design brief as Vidar 7, but with the express aim of making it exportable. Whereas previous designs had used UK MoD design standards and knowledge, this design was developed to be demonstrably based only on international design standards or publically available knowledge, which would enable UK Defence export approval to be obtained.

On 28 March 2018 Phil Watt from the Department of Defence's Naval Technical Bureau gave a presentation entitled *Armidale-class Patrol Boat Hybrid Propulsion Study*. The meeting was attended by 18 members and guests.

The talk was based on a desktop study that Phil had conducted in his role in the Naval Technical Bureau and stemmed from the observation that marine diesel engines such as those installed in the Armidale-class patrol boats (ACPB) run more efficiently at higher loads, but the ACPBs spend much of their time travelling or loitering at low speed. Two questions were therefore considered. Could an ACPB be fully powered (propulsion as well as hotel load) by its gensets? Would this be a more cost-effective propulsion arrangement, particularly at low speeds?

In order to drive an ACPB using its gensets, Phil proposed an arrangement whereby each generator would feed an electric motor fitted to the main gearboxes. When running at higher speeds (using the main engines), these motors could operate in reverse to generate electrical power. Initial calculations suggested that a single genset could power the ACPB at speeds up to 7 kn, both gensets could power it up to 11 kn and above this speed the main engines would need to be brought on-line.

The study investigated fuel consumption and maintenance costs (based on running hours) for the Armidales' design speed profile, an actual speed profile, and two theoretical speed profiles which represented the design speed profile skewed to reflect, firstly, mostly slow-speed running and, secondly, most high-speed running.

In so far as the study started off with an hypothesis, it was found that the most-notable cost savings would be realised due to operating the ACPB on generators alone when running at speeds below 11 kn — i.e. using both electric motors to drive the shafts. The study actually concluded that the best fuel savings were obtained by operating on one main engine, with the other main engine and both generators switched off. In this mode, the boat had one mechanically-driven shaft while the electric motor on the shaft acted as a generator and produced electricity to power both the hotel load plus the electric motor on the second shaft. However, overall fuel savings were only made possible due to the installation of the complete hybrid propulsion system and the use of the gensets at low speeds.

Once reduction in maintenance costs (through reduced running hours on the main engines) were factored in, the study estimated that overall cost savings would be realised after approximately 10 years.

The study demonstrated some of the benefits of fitting a hybrid propulsion system to naval vessels. It would appear to be worth considering similar installations on future RAN vessels, particularly those such as the new OPVs which are likely to spend a considerable amount of time in a slow-speed 'loiter' mode.

Tom Dearling

South Australian and Northern Territory Section

SA&NT Section Resuming Activities

After some time dormant, the SA&NT Section of RINA is in the process of resuming activities. There was an initial General Meeting on 1 March 2018 where an interim committee was appointed.

The mandate for that interim committee is to:

- Create awareness of the section within the maritime community.
- Organise technical presentations for the coming 12 months.
- Rebuild the governance and operational structures of the section and organise elections.

The interim committee is chaired by David Gonzalez, and includes Eric Fusil as Deputy Chairman, Peter Dandy as Honorary Secretary and Section Representative, Peter Samarzia as Assistant Honorary Secretary, Nic Clark as Honorary Treasurer, John Peel as Deputy Section Representative, and Haico van der Werf as Networking and External Relations Representative. David Gonzalez continues to be the SA&NT member of the Australian Division Council.

The elections are planned for 4 July, which will be during a Section General Meeting.

The interim committee is planning a series of initiatives to ensure that the newly-elected committee will have some time to develop the full potential of this Section; upcoming naval projects in Adelaide are expected to provide significant opportunities for RINA members from which to leverage.

David Gonzales

Western Australia

Recent presentations to the WA Section have covered wide-ranging topics.

On 14 March 2018, two presentations were given, the first by Alessio Mariani, Metocean Engineer, Woodside, entitled *Designing for Squalls — A Novel Approach to Squall Database Development.*

Squalls can be a challenge for designers of weather-vaning offshore facilities, such as turret-moored FPSOs. Squall winds increase and decrease rapidly and are often associated with wind directional shifts. The resulting sudden loads are often governing for FPSO mooring systems design.

This presentation provided insights into the development of a synthetic squall database covering 63 years, and combining direct wind measurements with weather balloon observations and historical maximum wind gusts. The squall database was a key input into mooring response-based analysis of a turret-moored FPSO located offshore in North Western Australia.

The second presentation was by Trevor Rabey, of Perfect Project Planning on the subject *Back to Basics — The Critical Path Method in Ship Building Projects*.

To quote the Fisher Maritime website, "Training for project preparation and project management is rarely formally addressed in the education of maritime industry personnel", including naval architects. Naval architecture training and education, and nearly all of the work in naval architecture, is dominated by the engineering design aspects. However, we all know that effective project management, which includes project controls, planning, scheduling, budgeting, tracking and reporting, is essential for any shipbuilding project, as well as for all of the other kinds. Project management is as much a part of the naval architect's responsibility as the technical design aspects.

Trevor's presentation was about the Critical Path Method (CPM), a foundation concept in project management. Engineers have had some exposure to CPM in their education, but this is usually limited. There is a tendency to rely on an intuitive appreciation and understanding of CPM, and to leave the details to the scheduling experts. To use the CPM effectively in project management and realise the potential benefits, it is essential to go beyond an intuitive appreciation and understanding, towards a thorough and precise definition and description of CPM. There is a reliance on effective and productive use of software tools. An appreciation and an understanding of CPM are essential in any situation involving the use of common software tools such as Microsoft Project and Primavera P6.

The presentation started at the very beginning and then revised, summarised and distilled the large topic down to the basics, the essential theory and its practical application.

Yuriy Drobyshevski

New South Wales

Annual General Meeting

The NSW Section held its twentieth AGM on the evening of 7 March, immediately following the March technical presentation in the Harricks Auditorium at Engineers Australia, Chatswood, attended by twelve with Phil Helmore in the chair, standing in for the Chair of the NSW Section, Valerio Corniani.

Valerio, in his Chair's Report (which Phil presented), touched on some of the highlights of 2017, which included eight joint technical meetings with the IMarEST (NSW-ACT Branch), with attendances varying between eight, on a dark and stormy night, and 50 for Steve Quigley's presentation on *Innovations on* Wild Oats XI.

Webcasting of presentations has come to something of a standstill. However, as noted by the President of the Australian Division in his column in the February issue of *The Australian Naval Architect,* the Victorian Section has agreed to conduct a trial recording of a technical meeting, with the recording to be funded by the Division Council, as it will be of most benefit to members outside Victoria. We watch with interest.

SMIX Bash 2017 was successful and was attended by 185, including a number of interstate guests. Many thanks to the organising committee of Nathan Gale (Chair), Adrian Broadbent, Graham Taylor, Craig Boulton, Len Michaels and Alan Taylor, and to the sponsors who supported the event because, without them, the "Bash" could not happen.

Adrian Broadbent presented the Treasurer's Report. The EA venue at Chatswood had, as usual, been our major cost for the year. However, with a close watch on the outgoings, we had managed to operate within our budget.

SMIX Bash is funded separately through the SMIX account which currently has a healthy balance, although there are accounts still to be paid, but projections are for a small surplus to balance last year's small loss and enable preliminary arrangements for SMIX Bash 2018.

There is a number of changes to the NSW Committee for 2018. Nate Gale and Sue-Ellen Jahshan have recently resigned from the Committee due to the pressure of other things. John Butler, Noel Riley, Jason Steward and David Wong have accepted positions on the committee. Adrian Broadbent has resumed the position of Nominee to the Australian Division Council after a break of two years. As a result, the committee for 2018 is as follows:

Chair and SMIX Bash Committee Chair	Valerio Corniani
Deputy Chair and TM Program and Website Coord	Phil Helmore
Treasurer and AD Council Nominee	Adrian Broadbent
Secretary	Anne Simpson
Assistant Secretary	Jason Steward
SMIX Bash Committee	John Butler
Auditor	David Wong
Members	Craig Boulton
	Noel Riley
	Alan Taylor
	Rob Tulk

The NSW Section is also represented on the Australian Division Council by Craig Boulton as Treasurer.

Committee Meetings

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

- SMIX Bash: The accounts for 2017 have been finalised, resulting in a tiny surplus which will go a small way towards balancing last year's loss; *James Craig* has been pencilled in for 2018, and the job of finding sponsors is about to begin.
- Technical Meeting Venues: A CBD venue for the meeting scheduled for October is being investigated.
- Portfolios: Positions were discussed and decided.

The NSW Section Committee also met on 8 May and, other than routine matters, discussed:

- SMIX Bash: *James Craig* has been booked for 2018 and deposit paid; sponsorship drive beginning, and flyer to be prepared.
- Technical Meeting Venue: A CBD venue for the meeting scheduled for October being further investigated.
- RINA to be represented at an Australian Defence Industry round-table conference.

The next meeting of the NSW Section Committee is scheduled for 10 July.

Phil Helmore

Acquisition of MATV *Sycamore*

Alex Robbins, MATV Acquisition Engineering Manager, Contractor to Defence, gave a presentation on *Acquisition of a Multi-role Aviation Training Vessel for the Royal Australian Navy* to a joint meeting with the IMarEST attended by 43 on 7 February in the Harricks Auditorium at Engineers Australia, Chatswood.

The Multi-role Aviation Training (MATV) MV *Sycamore* is a 94 m SOLAS Special Purpose Ship designed by Damen Shipyards and built by Damen in their Haiphong, Vietnam, yard for the Royal Australian Navy (RAN). The vessel is unique, being essentially a commercial vessel providing ADF-compliant aviation training capability to the RAN.

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

A New Lease of Life for Sydney's Iconic Floating Dock

Sean Langman, Managing Director, Belinda Tayler, General Manager Defence and Commercial, and Tim Sullivan, Engineering Manager, gave a presentation on *A New Lease of Life for Sydney's Iconic Floating Dock* to a joint meeting with the IMarEST attended by 60 on 7 March in the Harricks Auditorium at Engineers Australia, Chatswood. This was the second-highest attendance of the 103 technical presentations held at the Enginers Australia Chatswood venue, and second only to Sean's presentation on *The Quest for Speed Under Sail* back in March 2014!

Introduction

Sean began the presentation with an introduction to Noakes, which was established in 1979 as a rigging company. Today the wholly Australian-owned and -operated company encompasses two NSW boat and shipyards in North Sydney and Nelson Bay, as well as the Tasmanian sister yard at The Kermandie on the Port Huon River co-owned by Sean and his business partner, Christopher Stannard. From dinghies to tall ships, survey lifts and antifouling to major refits to osmosis repairs and complete paint jobs, Noakes has the experience, facilities and highly-skilled professionals to deal with maintenance and repairs on almost any vessel. Noakes offers a comprehensive maintenance and repair service, as well as offering boat owners the option of self-organised jobs using external contractors and, thirdly, do-it-yourself onsite at any Noakes yard. The reason for the success and expansion of the company is simple; Noakes is committed to providing the best advice and workmanship to its clientele.

Noakes

Sean said that he began his working life as a rigger, and then went into business in 1979 as a rigging company. He bought into the Noakes boatyard in Berry's Bay in 1981 with John Noakes, and built the business until it now operates the leading marine maintenance and repair facilities in NSW. They have been in business as a small-to-medium enterprise for nearly 40 years, a trusted contractor to Defence for over 30 years, and now seem to be the only Australian-owned Defence contractor. They are now a Key Divisional Supplier for the Department of Defence.

Noakes has three key markets: defence, commercial and recreational. In view of their defence commitments, they have had to change their recreational structure to suit defence. 75% of their work is recreational and commercial, and 25% defence, but they make 90% of their profit on defence work! The group now includes the ownership and operation of the fleet of five Rosman ferries.

Current Expertise and Capability

All sites operate travelifts for vessel removal from the water, and North Sydney has an additional 150 t slipway

Noakes' yard at Berry's Bay
(Photo courtesy Noakes Group)

capacity. They have a 30 year history of vessel operation and maintenance in NSW. They have efficient technical evaluation of vessel operational and compliance issues, with a hands-on management approach tempered with documented processes. They are highly skilled in timber vessel repair, GRP, aluminium and steel replacement.

They have an ISO Quality Management System of which they are justly proud, and are in the process of ISO Environmental Certification. They operate cross-site CMMS (Computer Maintenance Management System) MEXS, and this is also utilised on larger vessel maintenance projects. They have a dedicated staff of naval architects, engineers, riggers, shipwrights, and other trades. They have a formal project management and reporting system. All sites are secure with controlled access, and they are a Key Divisional Supplier to the Department of Defence.

Recreational and commercial repair contracts include ferries, yachts and power boats.

Defence contracts include the sail training ship (STS) *Young Endeavour*, the LHD landing craft storage, the SMB (survey motor boat) maintenance for the prime contractor, and the Red Viper [*the 20 m Australian Commando Unit Special Forces vessel designed for the Department of Defence (Army)*—Ed.] A point of difference in their defence contracting is that they do the paperwork in accordance with OQE (objective quality evidence) standards, and do the work themselves. The intention is to build the infrastructure so that they can do all the work themselves. They are a small bottom-feeder in the defence contracting area, and this is dangerous territory!

Future Vision

The vision for Noakes is for the continued growth of the company, which is currently 10% annually. This can be achieved by increased involvement with smaller naval asset maintenance, Government-department maintenance tenders, entering into the tug and barge repair sector, and targetting larger vessels. They have the self-belief to create something different and special.

However, there are several barriers to maintaining the current growth rate: the current slipway capacity is limited and there is no scope at the site for an increase, and the environmental compliance of the slipway is problematic.

The Floating Dry Dock

Belinda took over the presentation here, and said that a possible solution to Noakes' problem was the floating dry dock (FDD). The dock was constructed by Morts Dock and Engineering Co. in Sydney in 1944 and has been in Sydney Harbour servicing naval vessels at Garden Island ever since. It was purchased by Thales as part of the sale of the fixed and floating asserts of Australian Defence Industries, and saw service until it was decommissioned by Thales in 2011 and went to live in "rotten row" in Snails Bay.

Principal particulars of the FDD are

Length OA		64.00 m (original; 60.00 m now)
Breadth moulded		19.81 m
Depth	Pontoon	2.75 m
	Wing walls	7.77 m
	Overall	10.52 m
Usable Breadth		14.0 m between wing walls
Docking draught		8.5 m
Working draught		2.5 m
Docked vessel draught		5.7 m
Designed lift capacity		1000 t

When it was put up for sale, Sean saw an opportunity which no-one else could see, and purchased the dock in December 2014. The dock then spent a year moored in Berry's Bay, much to the displeasure of the local residents, while plans and arrangements were being made for its refit. In January

Floating dry dock for sale
(Photo courtesy Noakes Group)

2016 the FDD was towed to Yamba to begin a $4 million four-year refit at Harwood Marine. Much of the early work was done in the water while the slipway at Harwood was being repaired to take the dock.

The dock was originally built to Department of Navy requirements and not to any classification society rules. The vessel now requires AMSA survey as it is now considered commercial. However, the National Standard for Commercial Vessels has no requirements for FDDs, and the US NAVSEA requirements were considered applicable for the compliance required in order to perform Defence work. Noakes therefore engaged Shearforce Maritime Services to back-engineer the structure and confirm load and stability capabilities.

Pre-refit Condition

Due to the age of vessel, a large proportion of the pontoon and wing-wall structure is of riveted construction. The steel condition internally was generally good due to the quality of the steel and the remaining original coating system. However, the pontoon deck was covered in a matrix of doubler plates due to the poor condition of the deck.

Doubler plates on the pontoon deck
(Photo courtesy Noakes Group)

There were many old and redundant systems and machinery, such as steam power and six separate engines for power generation. The walkways and the pontoon-deck extensions were completely corroded. Numerous deckhouses and workshops had been installed on the safety deck, adding significantly to the windage and raising the centre of gravity.

Poor condition of internal tank paint
(Photo courtesy Noakes Group)

Internal tank paint was in poor condition due to lack of maintenance since decommissioning.

Pre-refit Concept

Prior to starting work, the following were the concepts which guided the refurbishment:

- The dock to be made into a mobile platform to be supported with shore-supplied services.
- Excess mass to be removed, including redundant equipment and structure, to maximise lift capacity and stability.
- The side-shore system to be rebuilt and vessel-handling winches to be refurbished.
- The reliability of the ballast system and its control to be ensured.
- Full environmental compliance was required — this meant that all water had to be retained on the pontoon deck.
- Ladders and handrails compliant with today's OH&S regulations to be fitted.
- Structure to be repaired as required and tanks and external hull fully painted.

The Refit

During the refit:

- The pontoon deck plate and supporting structure were totally renewed.
- The six generators and associated systems were removed and replaced with stand-alone units.
- All tanks were hydro-blasted and repainted.
- All ballast piping was replaced.
- All hull-side and internal valves were rebuilt.
- All old deckhouses were removed and one new aluminium control room was fitted.
- All access covers were removed and replaced.
- The firemain and vents were replaced.
- All side shores were replaced, including housings, and the drive motors were refurbished.
- New bollards were fitted.
- Deck winches were refurbished.
- Full non-destructive testing of structure was carried out.
- Wing-wall, deep-tank and hull plating was replaced as required.
- All doubler plates were removed.
- A tank-level monitoring and alarm system was installed.

- There was a complete external abrasive blast and re-paint.
- New lighting was installed throughout.
- New ladders and safety rails were fitted to current standards.
- New sponson were fitted for berthing.
- New anodes were fitted throughout.
- New metric draft marks were welded to the hull plating.
- A new environmental system was installed.

New metric draft marks
(Photo courtesy Noakes Group)

Refit Issues

Tim Sullivan took over the presentation here, and said that, during the refit, a number of unexpected issues cropped up and had to be dealt with.

A tri-butyl tin (TBT) antifouling paint system had been used on the underwater hull, and this had to be removed and disposed of as hazardous waste to landfill. This, of course, was expensive.

The end deep tanks were badly corroded due to their previous use as trim tanks, so significant plate and section replacement was required.

Steelwork replacement was, at times, problematic as plates had been joined with doubler strips and corners had been formed with plates lapped on angle bar.

Over 60 doubler plates had been installed on bottom plating, instead of plate replacement localised to affected tanks, leading to breakdown of the coating system.

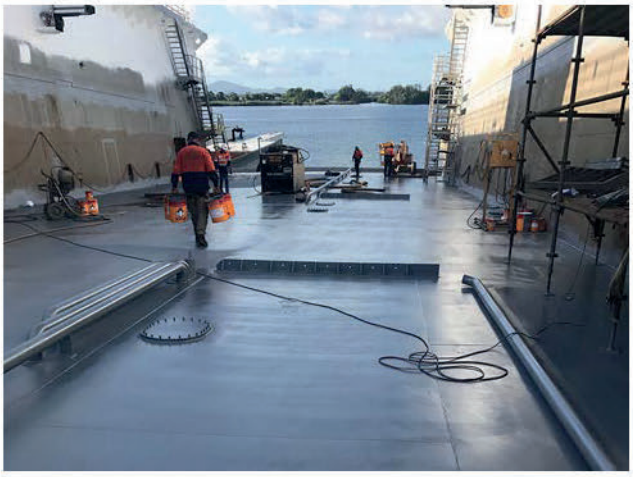
Full ultrasonic testing of the underwater hull was completed during the refit.

There were non-compliant penetrations between void spaces and through wing walls; i.e. penetrations of piping and wiring through bulkheads which were far from watertight.

There was significant breakdown of plating where temporary attachments had been previously welded, especially on the pontoon deck, safety deck and the wing walls.

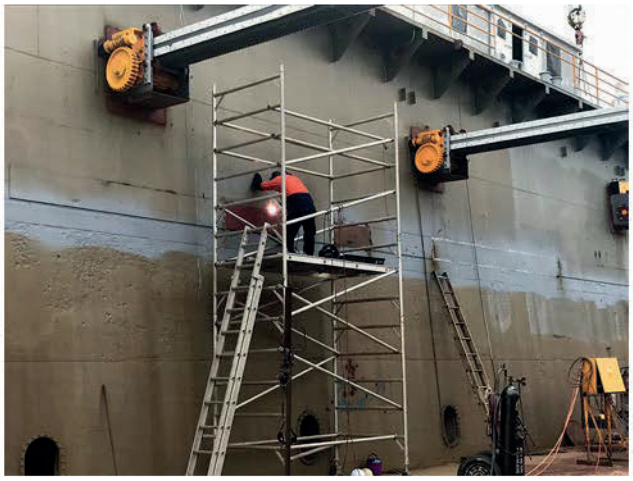
Ballast suction dishes were holed and had thin plate in all 12 ballast water tanks; like structure, these were formed by lapping over hull plate.

There was a serious lack of available technical information, so they were basically starting from scratch. They created a new operations manual, SMS, and drawings of all systems, etc. The last recorded inclining experiment was in 1974, so they had to carry out a new inclining experiment and provide completely new stability calculations and a new stability book. There was no record of any previous test and trial results, no pumping plan, no details of allowable deck loadings etc. This last required re-engineering of the existing structure to DNV GL's FDD rules and a check against the NAVSEA requirements.



The pontoon deck replated
(Photo courtesy Noakes Group)

Repaired and repainted internal structure
(Photo courtesy Noakes Group)



New side shores and refurbished drive motors
(Photo courtesy Noakes Group)

Engineering

Belinda took over the presentation again, and said that over 300 t of items (mainly from the upper safety deck) was removed during the refit. This has significantly reduced the KG and potentially increased the lift capacity of the dock, as the lightship draft has been reduced by 0.2m.

The plating on the pontoon deck has been increased from the original ½ in (12.5 mm) plate to 16 mm at the centre-line in way of the keel blocks.

A pumping plan program has been developed using tank volumes and allowable loads.

The intact and damaged stability have both been reassessed for compliance with AMSA and Defence requirements.

A towing plan to combine the FDD with Noakes' tug asset *Warren* has been developed.

The FDD has been set up to connect directly to the site services in place at Noakes' North Sydney hardstand.

The FDD at Noakes

Here Sean took over the presentation again.

A new 30-year lease has been issued by RMS to cover the additional water lease required. They are currently in the process of negotiating a new Development Application with North Sydney Council. Upgrades will be required to the wharf and piling, and it is expected that these will be completed after DA approval.

However, there have been objections to the DA by local residents, even to the extent of a "Say *No* to Noakes" Facebook page! In order to keep on side with local residents:

- The deckhouses, workshops and machinery have been removed from the safety deck, and a single control room installed, significantly lowering the profile of the dock.
- The dock could be moored east-west, projecting into the bay, but Sean has decided to moor it north-south, parallel to the shore and within the sea-bed lease, so that when there is nothing in the dock, the residents look though it longitudinally and see less of it. This will require the removal of two existing Noakes wharves, but is considered worth it.
- The dock has been made environmentally compliant, and will drop nothing into the harbour.
- There have been lots of maritime leases in Berry's Bay: Woodleys (now closed), Stannards (now closed), and the superyacht marina, so maritime activity is not new to the residents.
- Noakes have held public consultation meetings, and these have been helpful to both sides. The residents are concerned about noise aspects (working hours are limited anyway) and visual, claiming that their view affects their quality of life.

Proposed location of the FDD at Noakes in Berry's Bay
(Diagram courtesy Noakes Group)

Benefits for Sydney Harbour

Noakes sustains 120 jobs at the site in Berry's Bay. The FDD will create 40 new direct jobs and five apprentice positions, as well as providing additional indirect jobs through subcontractor support. The FDD will keep Defence and tug maintenance work within NSW. This is a fully Australian-owned company providing a local alternative, reducing downtime and fuel expenditure during docking periods.

For example, docking STS *Young Endeavour* in the Captain Cook graving dock costs around $350 000; she will be able to be docked in the FDD for much less.

In the longer term, Noakes expects that the refurbishment of the dock will be good for another ten years. They are already talking to a shipbuilder about a replacement!

Conclusion

Sydney's iconic floating dock has been rescued from the breaker's yard and given a new lease of life with a $4 million four-year refit at Harwood Marine in Yamba. The refit has restored the dock to full working condition, lowered the centre of gravity and improved the stability, restored the original lift capacity, made it environmentally compliant, and is set to allow Noakes' projected growth rate to continue.

Questions

Question time was lengthy and elicited some further interesting points.

The cost to refurbish the dock was around one-third of the cost of building a new dock.

RMS has issued a new 30 year lease to cover the additional water lease required. As the expected life of the dock is now around ten years, they are looking to the future and

considering a new dock as a replacement for the additional 20 years of the lease.

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

Adrian Broadbent with Belinda Tayler and Sean Langman (Photo John Jeremy)

Mission Planning for Autonomous Underwater Vehicles

Fletcher Thompson, PhD candidate at the Australian Maritime College, gave a presentation on *Robust Mission Planning for Autonomous Underwater Vehicles Cooperatively Inspecting Subsea Structures* to a joint meeting with the IMarEST attended by 13 on 4 April in the Harricks Auditorium at Engineers Australia, Chatswood.

Intervention-class autonomous underwater vehicles (I-AUVs) are highly-manoeuvrable low-endurance vehicles which are ideal for operation in and around complicated underwater structures. With modular docking technology, I-AUVs are capable of recharging, offloading data, and easily changing payloads, providing the opportunity for long service autonomous monitoring, inspection and maintenance of underwater structures.

This presentation covered the work done to produce an automated planner for a fleet of modular I-AUVs which can effectively allocate tasks to individual vehicles based on their individual capabilities and limitations, according to the urgency and dependencies of the tasks as part of the user-specified mission objectives. The planner was presented as a solver for an energy-aware variant of the Team Orienteering Problem with realistic, collision-free path planning using artificial potential-flow theory. The planner has been applied to a simulated offshore wind-farm inspection mission, with four I-AUVs working together to complete the mission objectives.

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

Biofouling on Ships

John Lewis, Principal Marine Consultant. ES Link Services, gave a presentation on *Biofouling on Ships: Character, Consequences, Concerns and Control* to a joint meeting with the IMarEST attended by 23 on 2 May in the Harricks Auditorium at Engineers Australia, Chatswood.

Introduction

John began his presentation by asking the question "What *is* biofouling?" and then answering in the following way: Biofouling is "a process of adsorption, colonisation, and development of living and non-living material on an immersed substratum".

The marine world of 10 000 years ago was not characterised (as it is today) by ships, barges, docks, floats, and pilings. Most of the invertebrate species typical of the fouling community are never found elsewhere. Most exist only on substrata where tidal exposure does not occur. In the pre-maritime-human environment, this habitat must have been restricted to natural floating materials, mainly drifting logs, which would have been most abundant in bays and estuaries.

John noted that the fouling of ships' hulls has troubled mankind for centuries. A translation from the Aramaic of

a papyrus dated about 412 BCE concerning boat repairs struck an optimistic note: "And the arsenic and sulphur have been well mixed with Chian oil thou broughtest back on thy last voyage and the mixture evenly applied to the vessel's sides that she may speed through the blue waters freely and without impediment".

In the third century, the Greeks were using tar and wax to coat ships' bottoms. In the 13th to 15th centuries, pitch, oil, resin and tallow were in use. The Chinese Admiral, Cheng Ho, had the hulls of his junks coated with lime mixed with poisonous oil to protect the wood from worms. Christopher Columbus was also familiar with the problem: "All ships' bottoms were covered with a mixture of tallow and pitch in the hope of discouraging barnacles and teredo, and every few months a vessel had to be hoved down and graved on some convenient beach".

Here John showed a number of photos, including the Battle of Trafalgar, which the British won by way of fouling control—the Spanish vessels all had fouled hulls and so were not so manoeuvrable!

The first application of copper sheeting to the bottom of a vessel was to HMS *Alarm,* and this subsequently became common practice in the Royal Navy fleet. However, with the advent of iron vessels, copper sheeting could no longer be used. From the late 1800s, they used copper oxide in varnishes, and the use of copper oxide in paints continues to the present day.

Here he showed recent photos of fouling, on various locations on ship sides and in sea inlets on different types of vessels.

Fouling on a tug in Cockburn Sound, WA
(Photo courtesy John Lewis)

Fouling in a sea inlet on an OSV in Bass Strait
(Photo courtesy John Lewis)

Fouling on a yacht left too long in the water!
(Photo courtesy Biosecurity NZ)

The Fouling Problem for Ships

Fouling presents a number of problems, not the least of which is that the additional drag from the fouling either reduces speed for the same power, or requires additional power to maintain the same speed. The antifouling paints release biocidal copper ions into the water, and California is trying to ban their use. More fuel means that more greenhouse gases are released into the atmosphere, more CO_2, NOx, SOx and particulate matter. Paint solvents mean that volatile organic compounds are released. Marine pests can be transported in ballast water and biofouling (a whole topic in itself!) And, finally, there are the costs—maintenance, paint replacement, fuel, etc.

What is the Economic Cost of Biofouling?

The antifouling paints and coatings market is projected to grow from USD 5.61 billion in 2015 to 9.22 billion by 2021. The overall cost associated with hull fouling for the US Navy's present coating, cleaning, and fouling level is estimated to be USD 56 million per year for the entire DDG-51 class, or USD 1 billion over 15 years.

In Australia, product sales of boat antifouling for the 2016–17 financial year were reported in the Commonwealth of Australia *Gazette* to be AUD 17 405 749.

The primary cost associated with fouling is due to increased fuel consumption attributable to increased frictional drag.

Antifouling Coating Types

There are basically two types of antifouling coatings: biocidal and non-biocidal.

Biocidal coatings use copper with or without organic biocides, and include the soluble matrix/ablative (where the matrix dissolves at the same rate as the biocide), diffusion/contact leaching/hard (where the biocide diffuses through a hard matrix), and the self-polishing copolymer (where the surface itself polishes away) types.

Non-biocidal coatings include the foul release (where the surface itself reduces the ability of organisms to stick on), mechanically resistant (usually hard epoxies, which have the advantage that they can be scrubbed), and novelty (e.g. fibrous, although none have yet been proven) types.

The International Convention on the Control of Harmful Antifouling Systems on Ships (2001) banned the application or reapplication of all antifouling containing organotins as biocides from 1 January 2003 and required that, from

1 January 2008, ships either not bear such compounds, or bear a coating which forms a barrier to such compounds leaching from underlying non-compliant systems. The convention entered into force in September 2008.

Antifouling biocides need to be

- toxic, yet non-toxic (killing everything!);
- stable, yet unstable;
- broad spectrum, yet not too broad; and
- leachable, but not too fast nor too slow.

Commonly-used co-biocides include Diuron, Irgarol, 4,5-dichloro-2-octyl-4-isothiazolin-3-one (DCOIT), zinc pyrithione (ZPT), copper pyrithione (CPT), Dichlofluanid, and Tralopyril.

There are three spheres of regulation for antifouling coatings: the chemical laws, emission laws, and biocide laws. All three of these overlap, and the area in which they *all* overlap is not harmonised, and is the area in which antifouling coatings tend to get caught.

Product Registration

Product registration in Australia is another problem. This is in the hands of the Australian Pesticides and Veterinary Medicines Authority (APVMA) and, when first given this responsibility, they knew nothing about antifouling. It can take up to eight years to have a new biocide approved and, for new paints containing approved biocides, approval can take up to two years. Barnaby Joyce's decision to move the APVMA from Canberra to Armidale has added further delays to approvals due to the large number of experienced staff not making the move. A case due for approval in October 2017 is now unlikely to be signed off until late June 2018, despite the required risk assessments having being completed!

Australia has only 53 antifouling products approved for use; countries overseas have hundreds. Here John showed some charts which indicated the rate of approvals in Australia, which vary from none to a high of seven in one year, but typically between one and four. More than half of the registered products were first registered more than 10 years ago, and 11 more than 20 years ago.

New Biocides

New biocides on the market include

- Econea (tralopyril) was developed by Janssen PMP, and is metal free and ten times more active than copper. It can be used with a copper biocide to reduce the coper content. It is supported under EU Biocidal Products Regulation, and is US EPA approved. It is already used in Sherwin-Williams Seavoyage Copper-free, International Interspeed 5640, West Marine CFA Eco, and International Pacifica Plus antifouling paints.
- Selektope (metadomidine) was developed by I-Tech in Sweden, and has a pharmacological mode of action to combat barnacle settlement. It temporarily stimulates the octopamine receptor in the barnacle larvae, and the larvae are repelled. I-Tech has a supply agreement with Chugoku Marine Paints. Selektope is endorsed by the EU Standing Committee on Biocidal Products and EU-wide approval was granted on 1 January 2016.

However, it could be ten years before products containing these biocides are approved for use in Australia.

Antifouling Options

The effective life of antifouling coatings is as follows:

Copper-based conventional	12–24 months
Copper-based erodible	36 months
Copper-based SPC	60 months
Biocide-free fouling-release	>60 months
Novel technologies	unproven

However, as the effective life increases, so too does the cost.

Air Emissions

The latest information has international shipping contributing approximately 2.7% of global carbon emissions. Even considering the effects of the global financial crisis, the predicted growth in global trade and the likely future emissions reduction from land-based industries means that, in real terms, the industry's percentage contribution is likely to significantly increase.

The *Third IMO Greenhouse Gas Study 2014* found that the average annual fuel consumption (2007–12) by all ships was between 247 and 325 Mt.

Another study in 2011 found that increasing fouling from FR-0 (a hydraulically smooth surface) to FR-30 (with heavy slime) increased fuel consumption by 10.3%

Ship Energy Efficiency Management Plan

The International Maritime Organisation has developed the Ship Energy Efficiency Management Plan (SEEMP) to help ship operators meet the Energy Efficiency Design Index (EEDI) requirements. The SEEMP is a ship-specific plan which can be efficiently implemented on vessels by planning, implementation, monitoring and self-evaluation and improvement.

The other focussed area of SEEMP is to reduce GHG emissions while increasing operational efficiency of the ship, resulting in less fuel consumption. Steps to achieve efficient operation of the ship under SEEMP include speed optimisation, weather routing, hull monitoring and maintenance, efficient cargo operation, and electric power management.

SEEMP is basically monitoring, carried out by shore staff who collect the data from the ship through engine-room log books, other ship records, and documentation. SEEMPs can include planning for annual in-water hull cleaning to minimise hull resistance.

Impacts of Invasive Species and the BWM Convention

There are estimated to be 500 alien marine species within the coastal waters of the USA (around 200 of these are in the waters of San Francisco Bay alone). Worldwide, the number is far higher. Why does this matter? Why should we be worried about it, when many intentionally-introduced alien species provide us with food, recreation or jobs?

That answer is that, while many species which are introduced into a new environment do no harm, many others have significant ecological, economic and human-health impacts. Invasive seaweeds are claimed to have smothered seabeds, invasive crabs to roam the sea floor eating everything in their path, invasive jellyfish leading to the collapse of fisheries and people having been killed by pathogens carried around in ballast water. Sometimes the impacts are quick and dramatic but, more often, they are indirect and subtle and may escape notice for some time.

On 8 September 20-17 IMO's Ballast Water Management (BWM) Convention entered into force. This is a global treaty

focussing on better management of invasive aquatic species and healthier marine ecosystems.

Invasive vs Non-indigenous Species

We must be careful to distinguish between "invasive" and "non-indigenous". Invasive species cause harm (of one form or another), and are a subset of all non-indigenous species, of which most are not harmful.

Ships have been identified as the single most-important vector for the dispersal of non-indigenous marine species around the world. On an international ship, every fouling species is a non-indigenous species on that artificially-created, newly-formed, mobile island. Jurisdictional definitions of non-indigenous species are artificial.

IMO Resolution MEPC.207(62)

IMO Resolution MEPC.207(62) *Guidelines for the Control and Management of Ships' Biofouling to Minimise Transfer of Invasive Aquatic Species* was adopted on 25 July 2011 and provides a globally-consistent approach to the management of biofouling on ships. The *Guidelines* give recommendations on general measures to be considered in order to reduce the risk of transfer of biofouling on ships, not only in relation to the aspects of choosing the right fouling control paint for the different parts of the ship, but also to give consideration to ship design, dry dock maintenance, recycling , crew training etc.

The *Guidelines* encompass

- Biofouling management plan and record book.
- Antifouling installation and maintenance.
- In-water inspection, cleaning and maintenance.
- Design and construction.

IMarEST/IPPIC Template

The IMarEST together with the International Paint and Printing Ink Council in 2017 published the document *Template for a Biofouling Management Plan*. Whilst the IMO *Guidance* detailed the information which is important to be recorded regarding fouling control, no formal template was provided in which to capture that information. The new document provides such a template to capture all relevant information prescribed in the IMO *Guidance*, with particular attention to coatings.

The template encompasses

- The choice of anti-fouling system (AFS) for the external hull, with a check list system to inform this choice.
- Selection of the AFS for niche areas where hydrodynamic conditions may differ from those found on the external hull.
- Planned management actions to be completed between dry dockings to minimise the biofouling on the hull.

However, it is ultimately the ship owner's or operator's decision to have and to maintain a biofouling management plan and biofouling record book on board their ship.

NZ Craft Risk Management Standard for Biofouling

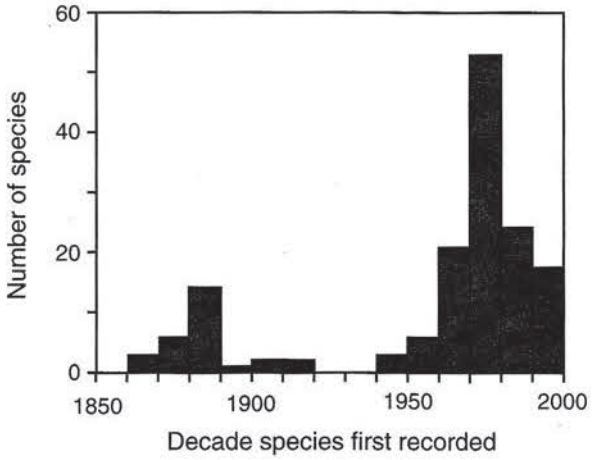
New Zealand's Craft Risk Management Standard came into effect on 15 March 2018, applies to all vessels arriving in New Zealand, and specifies the requirements for the management of biofouling risk associated with vessels entering New Zealand's territorial waters. The basic requirement is that all arriving vessels are "clean" below the waterline on arrival, with thresholds being governed by the vessel's itinerary

Short-stay vessels are in NZ waters for 20 days or less and only visit approved ports of first arrival. On entry to NZ waters, these vessels are allowed a slime layer, gooseneck barnacles, and slight fouling of early-stage biofoulers, e.g. barnacles, tubeworms or bryozoans.

Long-stay vessels are in NZ waters for 21 days or more and/or visit an area not approved as a port of first arrival. On entry to NZ waters, these vessels are allowed a slime layer and gooseneck barnacles, but no other fouling.

Marine Species in Australia

Non-invasive marine species are not new, as introduced species were first recorded in Port Phillip Bay in 1860.



Distribution by decade of the first records of introduced and crypogenic species in Port Phillip Bay
(Chart courtesy John Lewis)

However, there have been more than 200 years of maritime transport into Australia. In 2012–13 there were close to 30 000 commercial vessel calls to Australian ports, plus the many yachts and fishing, non-trading and defence vessels. About eleven species have been introduced that have established and, arguably, caused significant impacts. Only three of these species are considered likely to have been introduced in biofouling. The species include

Dry ballast	Carcinus maenas (European green crab)
Aquaculture—intentional	Crassostrea gigas (Pacific oyster)
Aquaculture—accidental	Codium fragile spp. fragile (green sea fingers), Grateloupia turuturu (devil's tongue weed), and Maoriculpus roseus (New Zealand screw shell)
Aquarium trade	Caulerpa taxifolia (killer algae),
Ballast water	Asterias amurensis (Northern Pacific seastar), Corbula gibba (European basket clam), and toxic dinoflagellates
Biofouling	Arcuatula senhousia (Asian date mussel), Sabella spallanzanii (Mediterranean fanworm), and Undaria pinnatifida (Japanese kelp)

Ship Biofouling

Over history, vessel hulls have been colonised by biofouling species that have the opportunistic traits and environmental tolerances to survive on these artificial habitats.

The speciose biofouling community which has evolved through the maritime era has been distributed into disturbed and artificial environments worldwide, and these species contribute to the majority of alien marine species found in any country, in their harbours and marinas, and on their vessels and maritime infrastructure. On an international ship, every fouling species is a non-indigenous species as the ship is a newly-created mobile island.

Most fouling vectored alien marine species which colonise new regions do not cause significant environmental, economic, human health or social impact, except as a contribution to the overall biofouling impact on vessel performance, mariculture infrastructure, coastal industrial plants, etc.

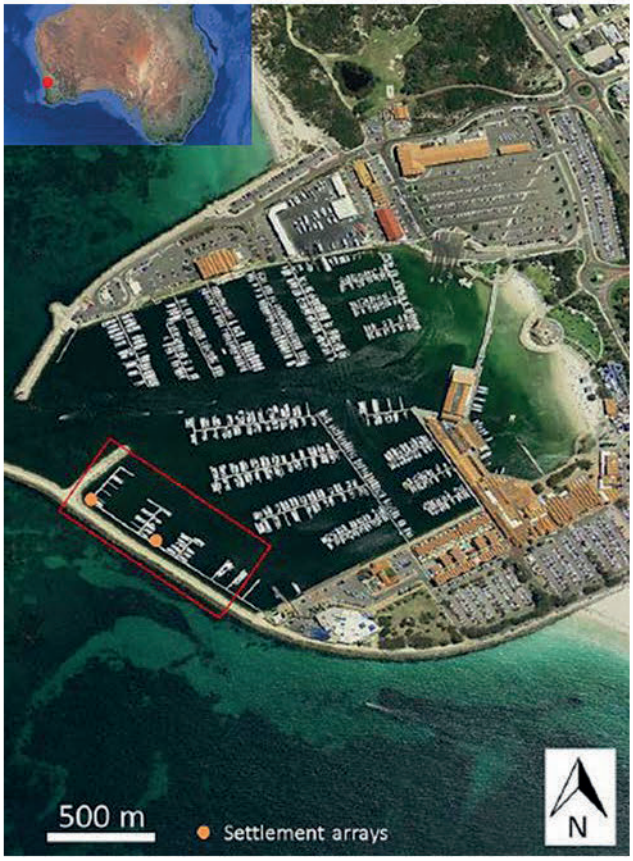
Ecological Impact

Marine biofouling by non-indigenous species is almost completely confined to artificial surfaces and structures and/or disturbed environments. Establishment of biofouling non-indigenous species is a secondary impact.

Here John showed an aerial view of Hillary's Boat Harbour in Perth, which is a totally artificial harbour. The area in which non-indigenous species were found is confined to the inside of the seaward breakwater (outlined in red in the diagram), and this can be compared to the enormous impact of the creation of the harbour itself!

Domestic Biofouling Species Spread

Here John showed a slide of the spread of Undaria pinnatifida (Japanese kelp) in Port Phillip Bay. After its first recording at Point Wilson in 1996, it was first detected in the Port of Melbourne in 1999, then progressively spread to Point Cook in the west, and Beaumaris in the south-east. Subsequent discoveries in Geelong (2007), Blairgowrie (2007), Portarlington (2008) and Queenscliff (2012), and outside the heads at Apollo Bay in 2009 (approximately 96 km south-west of the heads, and 154 km from St Kilda!), are all on piers or harbour structures and linked to movements of small craft.



Hillary's Boat Harbour in Perth, showing the location of NIS (Photo courtesy John Lewis)

In-water Cleaning of Ships' Hulls

The Australia and New Zealand Environment Consultative Council (ANZECC) published its *Code of Practice for Antifouling and In-water Hull Cleaning and Maintenance* in 1997. Under this code, no part of a vessel's hull treated with an antifouling coating was to be cleaned in Australian waters. In-water hull cleaning was prohibited, except under extraordinary circumstances and permission not normally granted. The cleaning of sea chests, sea suction grids and other hull apertures could be permitted, provided that any debris removed is not allowed to pass into the water column or fall to the sea bed. The polishing of ship's propellers could also be permitted, subject to any conditions attached to the permit.

The advantages of in-water cleaning include

- biosecurity;
- fuel savings;
- lower CO_2 emissions;
- corrosion control;
- extension of paint service life;
- cost vs. dry docking; and
- availability vs dry docking

The disadvantages include

- biosecurity; and
- chemical contamination.

Australia's Standing Council on Primary Industries endorsed a new publication, *Antifouling and In-water Cleaning Guidelines,* on 26 June 2013. These *Guidelines* replace the ANZECC *Code of Practice for Antifouling and In-water Hull Cleaning and Maintenance* and permit in-water cleaning if the growth has accumulated locally or, if accumulated elsewhere, by using equipment which captures the biological waste.

Technology Gaps

One of the gaps in our technology is a knowledge of good practice for sea inlet design. Most designs allow for an accumulation of biofouling which does not impede water flow, rather than minimisation of biofouling. A recent study by RMIT University investigated the flow of water through sea inlets according to their shapes. In a typical box-shaped inlet, there was a lot of circulation and large inconsistent regions of low wall shear. This meant that the antifouling coating can't work efficiently, and the wear rate is hard to predict. RMIT then designed a number of alternative shapes, and the shape with the best performance turned out to be almost conical, from the square base at the hull side to the circular entry to the ship's pipework. With this design, there were virtually no dead spots, minimal circulation, and a very uniform and predictable shear distribution.

Marine Growth Prevention Systems

Marine growth prevention systems are installed to prevent biofouling clogging seawater pipework. Methods include

- Direct chemical dosing, using sodium hypochlorite or an "antifouling" solution.
- Electrochemical dosing, using copper (or aluminium) anodes.
- Others, such as ultrasound.

The efficacy of various marine growth prevention systems has not been conclusively demonstrated.

IMarEST Special Interest Groups

IMarEST Special Interest Groups (SIGs) are voluntary groups which operate to the benefit of a specialist field. SIGs are governed by a committee of members, but all SIGs are open for all members to participate as corresponding members.

SIGs are developed to act as an enabler for the creation, transfer and sharing of knowledge. They utilise 'Nexus', the IMarEST's members-only collaboration and networking platform, enabling SIG members to discuss technical topics and to address conflicts and synergies within sectors. SIGs act as a portal for members and organisations seeking to improve their knowledge about the large variety of disciplines within the marine sector.

Special interest groups aim to:

- Advance the expertise and status of members working in the field, and to provide help and advice to expand their knowledge of the subject.
- Act as a clearinghouse for up-to-date, relevant information and make it available to members.
- Maintain and expand a network of members and affiliate organisations working in that area or who are simply interested in keeping up-to-date.
- Develop conferences, seminars, and other events related to specialist issues.
- Produce information and position papers on related topics.
- Provide impartial, timely and technically sound information to governments and Intergovernmental Organisations.
- Provide expertise and advice to those in the early stages of their careers.

IMarEST has 20 special interest groups, and one of these is the Ballast Water Management SIG.

Biofouling Management Expert Group

The Biofouling Management Expert Group (BMEG) was formed as a key output of the inaugural, IMarEST-supported ANZPAC Workshop on Biofouling Management for Sustainable Shipping which was held in Melbourne in 2013. This expert group aims to establish a platform for a united way forward on the key international issue of marine biofouling management, and is chaired by John.

Key issues include

- effective and practical biofouling management measures;
- biofouling management guidelines, requirements and regulations: present and future;
- in-water cleaning of ships' hulls: costs, benefits, impacts and regulation;
- regulation and scrutiny of new and existing fouling control coatings and antifouling biocides;
- costs and impacts of biofouling: ship energy efficiency and harmful aquatic species transfer; and
- ship biofouling management: best practice guidance.

Conclusion

Biofouling on ships is a problem, and has been with us for a long time. We need to focus our resources for greatest benefit, and identify the significant impacts: whether it is biofouling per se, or species specific. We need to determine effective management strategies to address identified risks as identified in the IMO *Biofouling Guidelines* and Australia's *Antifouling and In-water Cleaning Guidelines*, and risks associated with fuel consumption, domestic spread, improved antifouling technology, paints, and sea inlet design.

Questions

Question time was lengthy and elicited some further interesting points.

Marine growth in sea inlets can be checked by blasting steam through the sea inlets, say once per month, provided that the vessel has steam-generating capability on board. There has been a lot of work done on what level of temperature is required to kill various organisms, and it certainly needs to be an elevated temperature.

The Oberon-class submarines [*remember them?*—Ed.] used

to pick up tubeworms in their sea inlets when berthed at Neutral Bay. They would then go to Singapore (for example) where the higher water temperature led to rapid growth of the tubeworms, and they would require an emergency docking to clear their sea inlets! Conversely, the Anzac-class frigates picked up mussels in port and then, going south into colder water would lead to the death of the mussels, and the clogging of pipework with empty mussel shells.

An interesting feature of the construction of the Anzac-class frigates at Williamstown occurred during the fitting-out phase, with the ship berthed alongside a wharf. While the ship gradually accumulated fouling over most of the hull, nothing fouled *above* the zinc anodes. They worked out that the zinc anodes were interacting with the impressed-current cathodic protection system on the wharf, and were releasing bubbles of gas which ran up the hull and prevented marine growth.

Does ultrasonic hull cleaning work? John has done some testing, and has found that acoustic vibration can stop barnacles from settling. The larva comes onto the hull, and moves around looking for a place to settle. If nowhere favourable is found, e.g. due to acoustic vibration, then the larva moves off to find somewhere more to its liking. More generally he has seen no evidence that commercial systems work.

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

Phil Helmore

CLASSIFICATION SOCIETY NEWS

LR's New Underwater Noise Notation and ShipRight Procedure on Underwater Radiated Noise

Lloyd's Register (LR) has released a new underwater noise notation and ShipRight procedure on underwater radiated noise with the intention of helping shipowners minimise underwater noise emissions when operating in sensitive environments.

Increased focus is being placed on underwater noise emissions from vessels and this is creating the need for a means of controlling underwater noise radiation. New international standards and regulations are anticipated which will restrict access to environmentally-sensitive areas and limit the types of vessels calling at ports to only those complying with stringent noise level standards.

Several countries and ports have already introduced speed restrictions in sensitive areas. Some ports even offer discounts in port fees if the ship has an underwater noise notation which certifies compliance with a set of underwater noise limits.

LR's new underwater noise notation is based on the new ISO 17208 standard. LR actively participated in the development of this standard. The notation defines three criteria curves: Transit, Quiet and Research. The notation also includes a speed indication, e.g. 'UWN-L(T20)', which would mean that a vessel meets the underwater noise criteria in transit (T) at a speed of 20 kn.

In addition to testing and certifying vessels, LR will also work with shipowners during the design phase to predict and control the underwater noise emissions from vessels.

LR's Per Trøjgård Andersen, Technical Lead — Engineering Dynamics, commented "This new notation will not only help shipowners to reduce underwater noise radiation in sensitive environments, but will also demonstrate a commitment to environmentally-friendly practices, and even has the added benefit of potential discounts in port fees."

LR, *Press Release,* 2 March 2018

Bureau Veritas Launches World-wide e-Certification

Bureau Veritas is now issuing both classification and statutory e-certificates following successful pilots with ship owners and flag states. Bureau Veritas digital certificates may now be issued on behalf of 52 flag states, representing 72% of the Bureau Veritas-classed fleet.

E-certificates make life simpler for masters, ship owners and their staff as the related paperwork is time-consuming and can be expensive. E-certificates, delivered by email or accessible via the My VeriSTAR mobile application and the

VeriSTAR Info desktop portal, reduce the administrative burden both on-board and ashore.

Confidence and security are vital. Bureau Veritas implemented the electronic signature feature of the new digital certificates working with Cert Europe, electronic signature experts. Cert Europe is certified in accordance with applicable technical requirements and specifications for class and statutory certification and supports digital certification for the Bureau Veritas Group. In 2017, Bureau Veritas issued more than 50 000 e-certificates for different services including the inspection of shipping containers.

Bureau Veritas e-certificates provide significant benefits for all stakeholders, providing:

- reductions in administrative time and costs;
- secured accuracy;
- elimination of either the loss of or damage to original certificates — and the related risk of delay;
- reduced opportunities for fraud — no modification is possible without invalidating a signature; and
- quicker and easier management of certification, with secure storage and easy sharing of documents among stakeholders

Bureau Veritas e-certificates display the usual content and layout of class and statutory documents and they incorporate an electronic signature. Every time a Bureau Veritas surveyor goes on board a vessel, a new version of the e-certificate is issued to reflect either the endorsement or the renewal of the required certification. Endorsement, managed via e-certification, requires that no document now will need to be manually signed and stamped.

Certificate authenticity and validity can be verified via a secure online web portal using a QR code, URL or search via the certificate's unique tracking number.

Bureau Veritas e-certificates have been developed in compliance with IMO guidelines FAL 5/Circ.39/Rev 2, which invites flag state administrations to ensure that adequate national legislation is in place for the use and acceptance of electronic certificates.

BV, *Press Release*, 28 February 2018

Cyber Safety, Security and Autonomous Shipping

Bureau Veritas has developed a comprehensive approach to support shipowners in addressing maritime cyber risks. A new series of classification notations, guidelines and services enable owners to comply with regulatory requirements, safeguard their crews and protect their assets from both malfunction and malicious attack.

Bureau Veritas now offers two cyber notations:

The first, SW-Registry, focuses on software change management ensuring that installations of tested new software versions are properly tracked. It requires the creation and maintenance of a certified register of software used in the ship's onboard systems. SW-Registry is compulsory for newbuild ships using digital systems and enables owners to comply with IACS UR E22, applicable from 1 July 2017. Existing ships may choose to create their own register and would benefit from the additional class notation to help indicate their cyber safety level.

A second new notation, SYS-COM, addresses cyber security, and is directed at preventing malicious cyber attacks. SYS-COM is a voluntary notation covering the exchange of data between ship and shore. Bureau Veritas is now the only classification society to offer a notation for this specific risk, identified as a key cyber security threat to digital ship data and systems. The experience from projects with shipowners and providers of ship equipment and technology systems has been vital in developing and testing the Bureau Veritas approach. Recent announcements of projects with Bourbon and Kongsberg are examples.

The new notations are supported by specialist testing services delivered by Bureau Veritas and its partners. Testing services for cyber safety include software code analysis for potential safety risks and simulations using a mathematical model of the ship to test the code in hazardous situations. Cyber security risks are addressed through a security risk assessment, possibly completed by software penetration tests.

Additionally, NI 641 *Guidelines for Autonomous Shipping* was released at the end of December 2017. This guidance note contains the basis for the risk assessment of ships including autonomous systems, the goal-based recommendations for a minimum level of functionality of autonomous systems and the guidelines for improving the reliability of essential systems within autonomous ships.

BV, *Press Release*, 13 March 2018

Project to Advance Marine Lithium Battery Safety

On 5 March 2018 DNV GL announced the launch of a Joint Development Project (JDP), designed to advance the understanding of the use of lithium-ion batteries in the shipping industry. More than a dozen partners from the entire value chain have joined the initiative, including flag states, research institutions, battery and propulsion suppliers, fire-detection and extinguishing-system providers, and ship owners, operators and yards.

"Including batteries in ships, whether as a hybrid or fully electric system, offers the industry the opportunity to improve fuel economy, reliability and operational costs," said Geir Dugstad, Director of Ship Classification and Technical Director at DNV GL — Maritime. "For this technology to fully take hold, however, knowledge and requirements must be in place to ensure that we have products and a safety regime which address the concerns of all stakeholders while also creating the conditions for this technology to take off in the market."

The JDP brings together stakeholders from across the whole maritime industry, creating a deep pool of expertise, knowledge and experience from many different perspectives to develop a greater understanding of the challenges and requirements of expanding the use of batteries in the maritime realm. At the end of the JDP the partners hope that they will have enhanced their own understanding so as to optimise their own products and services, while also creating a set of inputs which can be taken up by the industry to not only push the development of the batteries themselves, but the associated systems, procedures, and approval processes. The JDP officially kicked off at the end of 2017, with major tasks defined as follows. The project will wrap up with

dissemination activities in 2019.

1. safety model development and assessment based on prior knowledge;
2. concerted lithium-ion battery risk assessment;
3. battery safety testing program;
4. battery safety simulation and analysis tool development and refinement; and
5. project management, dissemination, input to requirements and rules.

The project partners are:

- Norwegian Maritime Authority.
- Danish Maritime Authority.
- Norwegian Defense Research Establishment (Forsvarets Forskningsinstitutt, FFI).
- Corvus Energy, maritime battery systems vendor.
- Plan B (PBES), maritime battery systems vendor.
- FIFI4MARINE, lithium-ion fire extinguishing system provider.
- Nexceris, developer of battery off-gas sensing technology.
- Rolls Royce Marine AS, propulsion and system technology provider.
- ABB, propulsion and system technology provider.
- Stena, ferry owner and operator.
- Scandlines, ferry owner and operator, including largest maritime battery installation in the world.
- Damen, shipbuilder.
- DNV GL.

FROM THE CROWS NEST

World Water Speed Record

Warby Motorsport conducted another trial of *Spirit of Australia II* on the Manning River at Taree, NSW, in February. The team had made some minor modifications to the boat and, as the Manning River is only one-and-a-half hours away from the Team's workshop, it was an ideal location to test the boat before going back to Blowering Dam in May.

The Team were very pleased with the weekend at Taree, and some minor issues with communication systems have been resolved. Warby Motorsport has been using the Manning River for testing jet-powered boats (*Spirit of Australia, Aussie Spirit* and *Spirit of Australia II*) since the early 1970s.

The team visited Blowering twice in 2017 to test *Spirit of Australia II* and, though conditions weren't ideal, they were happy with the progress. David Warby and his team expect to be back at Blowering Dam in late May to continue to test the boat for the attempt on his father Ken's water speed record. David is attempting to beat the record of 511 km/h set by Ken on Blowering Dam in *Spirit of Australia* in 1978.

Spirit of Australia II on the hard at Taree
(Photo from Warby Motorsport website)

The run at Taree is 2 km long, where the run at Blowering Dam is 10 km long. "It takes time to build speed up", David said. "The speed we are doing now (about 300 km/h) it took Ken almost two years to build up to. People want you to just go out and break the record, but if you want to do it safely, it doesn't work like that."

Spirit of Australia II at speed on the Manning River
(Photo from Warby Motorsport website)

David Warby and *Spirit of Australia II* returning form trial runs
(Photo from Warby Motorsport website)

Team Britannia

Team Britannia is a multi-million-pound British bid led by ocean adventurer, Alan Priddy, to design and build 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.

The team's website at www.teambritannia.co.uk seems to have been dormant for a considerable time, and their Facebook page seems to have taken over as the principal conveyor of progress.

The vessel has now been named *Excalibur*, and construction has reached the main deck stage, with the fuel tanks being installed in April.

However, the projected date for commencement of sea trials in late spring/early summer seems optimistic.

Forward fuel tanks installed on *Excalibur*
(Photo from Team Britannia Facebook website)

Fuel Cells Back on the Agenda

In a search for alternatives to fuel oil for ships, only LNG has yet made any real progress. For some niche vessels, methanol and ethane have also proved to have a place and, in recent years, energy-storage systems have proved to be a good way to make the most of power which would have otherwise have gone to waste.

Fuel cells — once considered the best option for the future — dropped out of the picture after just one or two installations and companies which had been pioneers put the idea on the back burner. However, interest in the idea never went away entirely and, in November last year, ABB made an announcement which indicates that a revival of fuel-cell projects could be on the cards.

The new project involves ABB and a Royal Caribbean International vessel and will be the first fuel-cell system to provide an energy source for a luxury cruise ship. "This pilot installation demonstrates that fuel-cell technology is now firmly in the sights of the cruise industry," said Juha Koskela, Managing Director, ABB Marine & Ports. "Fuel cells have been the next big thing for 25 years, but now they are reality."

The pilot installation, including control, converter and transformer technology from ABB, will generate 100 kW of energy, and has been fully developed, marinised, assembled and tested by ABB Marine & Ports. ABB selected an FCvelocity proton exchange membrane (PEM) pure hydrogen fuel cell engine from Ballard Power Systems for its pilot system.

The output of the fuel cell at 100 kW is not a major contribution to a cruise ship's power demand, and it is considerably smaller than the 330 kW fuel-cell system installed in 2009 on the offshore vessel *Viking Lady*. Information available on the Ballard Power Systems website indicates that the fuel cell selected for the new project is considerably smaller than that in the earlier project with a size of around 0.5 m^3 and weighing 285 kg, but it also requires two other modules — one for coolant and the other for air — which add to the size and mass.

Liquid Hydrogen Makes its Debut

A much larger fuel-cell system will be needed if another ambition announced last year is to be realised. Some weeks before ABB's announcement, Viking Cruises — operator of the first international LNG-fuelled ferry, *Viking Grace* — revealed that it was hoping to build a 230 m, 900 passenger ferry powered by hydrogen fuel cells.

The hydrogen would be carried in liquid form which means a system capable of maintaining the fuel at –253°C, considerably colder than the temperature needed for LNG. At present, liquid hydrogen is not produced on a large scale in Europe, but Viking Cruises is apparently in dialogue with Statoil in order to find a solution based on a Norwegian refinery.

The alternative to using fuel cells is to burn liquid hydrogen in an internal combustion engine. This has its problems for, as well as the need for a liquid-hydrogen fuel system, hydrogen can cause metals to become brittle and, because of the small size of the molecules, readily diffuses through many materials.

In December, *Hydroville* — a 14 m catamaran passenger shuttle — became the first LR-classed vessel to use hydrogen to power a diesel engine. *Hydroville* is owned by Belgian operator CMB and is a showcase for the use of clean fuels, and is primarily a project to test hydrogen technology for applications on larger vessels. CMB has plans for a hydrogen-powered auxiliary engine on an ice-classed feeder container ship.

The engines in the vessel are a pair of H2ICED units with a combined total shaft power of 441 kW. The engines are modified common-rail Ford diesel automotive engines which have been used in several prototype road vehicles and other applications. They can run on hydrogen or standard diesel fuel. The fuel system for *Hydroville* comprises 12 hydrogen tanks (205 L @ 200 bar) and two diesel fuel tanks (2×265 L) as pilot/backup fuel.

Hydrogen is undoubtedly a clean fuel but, to produce it, requires more energy than the fuel itself holds. That means that any polluting effect is merely pushed back up the line unless the production facility receives its power from sources such as hydroelectricity, nuclear or some renewable source.

https://shipinsight.com/fuel-cells-back-agenda/

Rotor Sail For Wind-assisted Propulsion.

The Viking Line has installed a rotor sail on the LNG-fuelled *Viking Grace*, making it the first passenger ship in the world equipped with a rotor sail for the utilisation of wind power. LR approved the structure and the risk-assessment related to the installation of the sail in line with its *Guidance Notes for Flettner Rotor Approval*. The approvals were conducted to ensure that the Flettner rotor would not adversely affect the safe operation of the ship or the safety of the crew.

The rotor sail, developed by Finnish company Norsepower Oy Ltd, is expected to cut fuel consumption and reduce emissions by up to 900 t of CO_2 annually. *Viking Grace* is already operating on wind-assisted voyages between Turku, Finland, and Stockholm, Sweden. The LNG-fuelled ferry has been in operation since 2013 when LR helped Viking Line handle the complexities of the LNG tanks on the stern deck as well as its regulatory, class and operational requirements.

Viking Grace
(Photo by Tuukka Ervasti, courtesy LR)

The cylindrical rotor sail installed on *Viking Grace* is 24 m in height and 4 m in diameter and uses the Magnus effect for propulsion. As the rotor is spinning, the passing air flows with a lower pressure on one side than the opposite side. The propulsion force created by this pressure difference drives the vessel forward. The rotor sail operation is automated and the system will shut down in response to any disadvantageous changes in the direction or force of the wind.

"The use of wind power reflects Viking Line's green values and we want to pioneer the use of solutions which reduce that impact on the environment. Based in Finland, Norsepower has developed a world-class mechanical rotor sail solution which will reduce fuel consumption. We are proud of the fact that *Viking Grace* will be the first passenger ship in the world to benefit from this innovative solution," said Jan Hanses, CEO of Viking Line.

LR's Jane Jenkins, Lead Specialist, Passenger Ship Support Centre, commented: "A few years ago LR developed an animation called *The Ferry – a Story of Innovation*, which at one point shows a ferry with wind rotors and kite sails sailing across the screen at breakneck speed. At the time rotor sail technology was clear but not immediately contemplated in the context of a ferry. It is wonderful to see what seemed like an idea at the time become a reality. We are immensely proud to have been part of the journey."

In addition to the rotor sail solution installed onboard *Viking Grace*, Viking Line plans to use wind propulsion in the company's new vessel, due to be operational in 2020. Built in China, the passenger ship will be equipped with two mechanical rotor sails supplied by Norsepower, doubling the wind power potential.

Lloyds Register, 30 April 2018

GENERAL NEWS

OPV Contract for Civmec

On 16 April Civmec announced that the company had been awarded a contract from Lürssen Australia in relation to the RAN's Offshore Patrol Vessel (OPV) project.

The awarded scope includes the supply and processing of steel for all twelvevessels. Following the build of the first two vessels in South Australia, the company will undertake specific fabrication and construction activities for the following ten vessels. Final consolidation of the ten vessels will be undertaken in the company's new world-class shipbuilding facility, which is currently under construction adjacent to its existing waterfront facilities and head office at Henderson, Western Australia.

The company has begun mobilising personnel and equipment to ensure that steel for the project is cut in time to begin of construction of the first vessel in South Australia in the fourth quarter of 2018.

Pat Tallon, CEO of Civmec, said "Securing such long-term work is great news for the company, our employees and our current and future apprentices and trainees. It reinforces our decision to invest in the development of a new state-of-the-art shipbuilding facility at our Henderson yard."

James Fitzgerald, Executive Chairman of Civmec, said "The award of this contract is of momentous significance for the company and will underpin both the company's growth, and the development of its employees, for current and future generations."

"Both Lürssen and our company have similar corporate attitudes and a culture of maximising efficiency while maintaining excellent standards of safety and quality. We are looking forward to working with Lürssen on this project and further strengthening our relationship to target additional opportunities together in the future."

An impression of Australia's new OPVs
(Image courtesy Lürssen)

Offshore Patrol Vessels not for Austal

In November 2017 the Commonwealth Government selected Lürssen as the prime contractor to supply 12 new offshore patrol vessels (OPV) for the Royal Australian Navy.

At the time, the Government also asked Lürssen to explore options to leverage the wider shipbuilding experience base at Henderson in Western Australia, potentially opening an option for Austal to participate in the WA build program, subject to commercial negotiations.

On 11 May 2018 Lürssen announced that negotiations between Austal, which had been underway since December 2017, had not been able to reach a viable commercial agreement. Lürssen will build the 10 WA OPVs at Henderson in partnership with Forgacs, a wholly-owned subsidiary of Civmec. Civmec will soon list on the Australian stock market.

Austal Delivers Seventh LCS

On 2 March Austal delivered the seventh vessel in the Independence-variant littoral combat ship (LCS) class to the US Navy.

The future USS *Manchester*
(US Navy photo)

The future USS *Manchester* (LCS14) is the second LCS delivered to the Navy by Austal in less than six months, following the USS *Omaha* (LCS 12) commissioning, which took place in San Diego earlier this year.

"We're very happy to be delivering another LCS to the US fleet and the efficient and reliable delivery of these ships is a testament to the incredible skill and hard work of the shipbuilding professionals at Austal USA," Austal's Chief Executive Officer, David Singleton, said.

"The technology we have invested in Mobile allows Austal USA to operate with unmatched efficiency which, when combined with our skilled workforce, offers a world-leading solution to build for the United States Navy and support their planned expansion to a 355-ship fleet," Mr Singleton said.

"Our LCS program is also a significant economic undertaking; more than 900 suppliers in 41 states contribute to the program, and this supplier base supports tens of thousands of jobs," he said.

Six LCS remain under construction at Austal's Alabama shipyard and I am confident that Austal will continue to deliver these vessels with the efficiency and reliability we have become known for," Mr Singleton said.

Assembly is underway on *Cincinnati* (LCS 20) and *Kansas City* (LCS 22) and modules for *Oakland* (LCS 24) and *Mobile* (LCS 26) are under construction. Construction on LCS 28, recently named *Savannah* and LCS 30, recently named *Canberra* is to begin later this year.

Austal is also under contract to build 12 Expeditionary Fast Transport vessels (EPF) for the U.S. Navy with nine vessels delivered so far.

US Navy to Name LCS 30 after Australian WWII cruiser HMAS *Canberra*

The US Navy's next littoral combat ship, the Independence-variant LCS 30, will be named USS *Canberra*, US President Donald Trump announced in a White House news conference with Australian Prime Pinister Malcolm Turnbull on 23 February.

The LCS will be the only US Navy vessel named for a city outside the US and the second to bear the name.

The first USS *Canberra* was a US Navy cruiser named after the Australian cruiser HMAS *Canberra* which was lost during the Battle of Savo Island.

"Our Secretary of the Navy has chosen Australian Minister of Defence, Marise Payne, to be her sponsor. I know that USS *Canberra* will be a worthy successor to her Australian namesake and her American predecessor, the former US Navy Baltimore-class heavy cruiser, USS *Canberra*," President Trump said. "As she sails the open sea, the new USS *Canberra* will symbolise to all those who cross her path the enduring friendship between the United States and Australia. There is no closer friendship."

The 127 m vessel will be built by Australian-based shipbuilder Austal at its US shipyard in Mobile, Alabama.

Austal Christens Tenth EPF

On 4 March Austal celebrated the christening of the tenth Expeditionary Fast Transport, USNS *Burlington* (EPF 10), with a ceremony at the company's facility in Mobile, Alabama. In attendance was the ships sponsor, Mrs Marcelle Leahy, and her husband the Hon. Patrick Leahy, US Senator for Vermont.

The Austal-designed and built EPF is part of a 12-vessel program under contract with the US Navy with a combined value of over $US1.9 billion.

USNS *City of Bismarck* was the latest EPF to enter service in late 2017 and three more of the vessels are under construction at Austal's Mobile shipyard.

Anzac-frigate Sustainment Contract

On 2 March the Minister for Defence Industry, the Hon. Christopher Pyne MP, announced the extension of an agreement for the sustainment of the RAN's Anzac-class frigates with BAE Systems Australia, Saab Australia, and Naval Ship Management Australia (a joint venture between Babcock and UGL Limited — formerly United Group Limited).

Minister Pyne said that the $1.2 billion five-year follow-on program of work covers sustainment of the eight Anzac-class ships and their shore support and training facilities.

"This strategic partnership will see highly-skilled jobs secured around the country, including in small and medium-sized businesses," Minister Pyne said.

The majority of the work will be done in Henderson, further cementing it as one of Australia's naval shipbuilding and sustainment centres." Sydney, Adelaide and Williamstown will also benefit as a result of this contract.

Minister Pyne said that the five-year program of sustainment work is unique in the maritime domain and provided long-term certainty to Defence industry, enabling the continued investment in skills and capability development.

The agreement takes into account a key recommendation of the First Principles Review by enabling Defence to focus on governance while contracting industry to do what it's best at — planning, managing and delivering the sustainment of the Anzac-class frigates.

Defence Industrial Capability Plan

On 23 April 2018 the Commonwealth Government released the Defence Industrial Capability Plan which outlines Australia's long-term vision and objectives for Australia's defence industry, and how the Government and Defence will partner with industry to achieve that vision.

Minister for Defence Industry, the Hon. Christopher Pyne

MP, launched the Plan in a speech to the Australian Strategic Policy Institute. The Plan acknowledges the importance of a stronger, more resilient and internationally-competitive defence industry.

"The Plan addresses Australian defence and defence industry sovereignty and outlines the initial Sovereign Industrial Capability Priorities," Minister Pyne said.

"The Government is already investing $200 billion in Defence capability over the next decade through the Integrated Investment Program.

"Importantly, the Plan makes clear that to be considered an Australian Defence company having an ABN and a shopfront is no longer enough — we want to see Australian leadership, an Australian board, and an Australian workforce value-adding right here at home"

"This Plan highlights a range of opportunities for Australia's defence industry over the next decade and reinforces the sustained partnership we need to position our defence industry to meet our defence capability needs."

The Sovereign Industrial Capability Priorities are industrial capabilities critical to achieving the Australian Defence Force's operational mission and to the development of our future force over the next few years.

The initial Sovereign Industrial Capability Priorities are:

- Collins-class submarine maintenance and technology upgrade;
- continuous shipbuilding program (including rolling submarine acquisition);
- land combat vehicle and technology upgrade;
- enhanced active and passive phased-array radar capability;
- combat clothing survivability and signature reduction technologies;
- advanced signal processing capability in electronic warfare, cyber and information security, and signature-management technologies and operations;
- surveillance and intelligence data collection, analysis, dissemination and complex systems integration;
- test, evaluation, certification and systems assurance;
- munitions and small arms research, design, development and manufacture; and
- aerospace platform deep maintenance.

"The Priorities will be strategically managed across defence planning and decision-making processes from strategic guidance to force design, the Capability Life Cycle, including the Australian Industry Capability Program, and industry and innovation programs," Minister Pyne said.

"A dedicated Sovereign Industrial Capability Priority grants program with funding of up to $17 million per year will commence in the second half of 2018."

Implementation of the Plan will be supported by Australian industrial strategies for each of the six Integrated Investment Program capability streams and Implementation Plans for each Sovereign Industrial Capability Priority from mid-2019.

The Plan also highlights the range of existing and new defence industry and innovation programs which will be used as a system to build the capability of our defence industry, providing a valuable information source for companies seeking to support Australia's defence capability.

The Defence Industrial Capability Plan can be downloaded from: www.defence.gov.au/SPI/Industry/CapabilityPlan.

Docking of MV *Sycamore*

The Multi-role Aviation Training Vessel (MATV) MV *Sycamore* was docked for maintenance for the first time in mid April. Having developed a close working relationship with Teekay Australia via sea trials and delivery-voyage crewing arrangements, ASC Shipbuilding provided project management and production labour to the Teekay-managed vessel. In the end it was a routine docking, with *Sycamore* departing on schedule later in April.

The docking also enabled the ASC Shipbuilding AIR9000 upgrade team a chance to step aboard the vessel and learn about some of the new systems and general arrangement features which will play a part in the first major Hobart-class upgrade to support the new MH-60R Romeo helicopters. Thanks go to the *Sycamore* management team and the Teekay crew for taking us around.

Nic Clarke
Lead Naval Architect
Air Warfare Destroyer Alliance

Sycamore being readied for re-launching
(Photo courtesy Dan Tootell)

Austal Catamaran Delivered to Germany

Austal has handed over *Halunder Jeta*, a new 56 m high-speed passenger ferry, for Förde Reederei Seetouristik (FRS Group) of Germany.

The vessel departed Austal Philippines shipyard in Cebu on 7 March 2018 and formal delivery and handover took place upon arrival at FRS Group in Hamburg, Germany.

Austal was awarded the $22million contract for the design and construction of the aluminium catamaran in December 2016 and has built the vessel at the company's shipyard in the Philippines in just 12 months.

Austal Chief Executive Officer, David Singleton, said that the vessel was a great demonstration of the company's ability to develop and construct advanced maritime technology in a global market.

"The advanced design and smart-ship technology which delivers superior performance and seakeeping for this fantastic looking ship was developed here in Australia and

Halunder Jeta, the 56 m high-speed passenger ferry recently delivered by Austal to Förde Reederei Seetouristik of of Germany
(Photo courtesy Austal)

The wheelhouse of *Halunder Jeta*
(Photo courtesy Austal)

Passenger accommodation in *Halunder Jeta*
(Photo courtesy Austal)

then constructed in the Philippines to our exacting standards, Mr Singleton said.

"Austal's design team has developed an optimised hull form which not only minimises fuel consumption and wake wash but also provides superior strength and stability at speeds exceeding 35 kn on open seas," he added.

"Innovations like Austal's MARINELINK-Smart and Ride Control are being sought out by operators like FRS, as they help to deliver a better customer experience — and a greater return on investment."

The 35 kn vessel is capable of carrying 680 passengers and features two classes of passenger accommodation (including leather-appointed reclining seats with USB chargers), enhanced passenger accessibility (including an elevator between passenger decks), a programmable, energy-efficient LED lighting system and large windows offering expansive views throughout the cabin. Two exterior passenger decks offer an outdoor experience for FRS customers travelling the popular River Elbe route between the Port of Hamburg and Helgoland.

Austal Wins Contract for US Frigate Concept Design

In February Austal announced that it had received a $US15 million dollar fixed-price contract for the US Navy's guided-missile frigate FFG(X) concept design.

The contract will develop the Austal frigate design to meet the FFG(X) system specification with the goal of reducing cost, schedule, and performance risk for the follow-on detail design and construction contract.

"Austal welcomes this contract as an endorsement of our advanced, technology-focused design; something that underpins everything we do and is at the heart of what has built our reputation over the last 30 years," Austal CEO, David Singleton, said.

"Our continued investment in research and development to support the technology of our vessels has kept our designs at the forefront of advanced naval capabilities," Mr. Singleton said.

"Austal's design department is always increasing its

capability to offer the latest technological developments on all our platforms," he said

"Highly technical engineering, research and development, and advanced digital design concepts are continually improved to set the standard of what is possible in naval design.

"With this latest announcement, the United States has recognised the importance of being able to operate the most advanced naval vessels, and we are excited to work with them to develop the technology to do this.

"Our design team in Mobile will be leading the work on the Austal frigate, and I have every confidence that they will excel in delivering the next-generation frigate design to support the United States Navy," Mr Singleton said.

The conceptual design effort will inform the final specifications which will be used for the detail design and construction request for proposal that will deliver the required capability for FFG(X).

Austal Contract for Trimaran Ferry

Following the Memorandum of Understanding (MoU) announced on 8 December 2017, on 5 March Austal confirmed the award of a $68 million contract to design and build an 83 m trimaran ferry for JR Kyushu Jet Ferry of Japan.

Australia's Ambassador to Japan, the Hon. Richard Court AC, and Japan's Consul-General in Perth, Tatsuo Hirayama, joined Austal's Chairman John Rothwell AO, and Chief Executive Officer, David Singleton, for a signing ceremony at the Australian shipyard with JR Kyushu Jet Ferry's President, Masayuki Mizuno, and General Manager, Planning, Hitoshi Ogawa.

"Austal congratulates JR Kyushu Jet Ferry on the selection of our proven trimaran platform to expand their Japan-to-South Korea route. This exciting new vessel will deliver excellent seakeeping and an unparalleled customer experience to JR Kyushu's ferry network," Mr Singleton said.

"This contract is an outstanding start to 2018 for Austal, following a record year for commercial vessel sales in 2017, and reflects our continued focus as a technology-led organisation in developing industry-leading, customised solutions for commercial operators around the world.

Ben Marland, Vice President Sales and Marketing, added "Austal's unique trimaran hull design has truly revolutionised the commercial and defence vessel markets. This is the first high-speed trimaran ferry we have placed into Japan and we are delighted to be partnered with JR Kyushu Jet Ferry on this prestigious route.

"With nine Austal trimarans already in operation around the world, another seven under construction and now five on order, it's fair to say that we are seeing a transformation in the market and genuine customer enthusiasm for the proven technology, efficiency and capability of our design," Mr Marland added.

The 83 m trimaran, with a capacity for 502 passengers and an operational speed of 37 kn, will service JR Kyushu Jet Ferry's key strategic route between Fukuoka, Japan and Busan, South Korea. The vessel will feature a customised interior, developed by respected Japanese design house, Don Design Associates, led by Eiji Mitooka, famous for the luxuriously-appointed interiors of JR Kyushu's high-end passenger trains.

An impression of the 83 m trimaran high-speed passenger ferry to be designed and constructed for JR Kyushu Jet Ferry (Image by Eiji Mitooka, Don Design Associates)

Construction of the vessel will commence in late 2018, with services scheduled to begin prior to the Summer Olympic Games in Tokyo in 2020.

Austal acknowledged the assistance provided by the Australian Trade Commission Office in Japan in achieving this landmark sale, and in particular, Ian Brazier, the Consul-General and Trade Commissioner in Fukuoka, as well as the Shintoa Corporation of Japan.

Navantia Cuts Steel for Second RAN AOR

Navantia has officially started construction work on the second Royal Australian Navy AOR (the future HMAS *Stalwart*) with a steel-cutting ceremony on 4 April 2018 at the company's Fene facility in northwestern Spain.

According to Navantia, construction of both ships will require an estimated three million working hours to complete them.

The AORs *Supply* and *Stalwart* are being built under a contract signed with the Australian Government in May 2016. The ships are based on the Spanish Navy's AOR ESPS *Cantabria* and will be delivered at a cost of $640 million.

Cutting the first steel for the future HMAS *Stalwart* (Photo courtesy Navantia)

Australia's Largest Lobster Boat Delivered

Dongara Marine has delivered Australia's largest capacity high-speed lobster boat, the 25.75 m *Holdfast*.

With capacity for 210 baskets or 6.2 t of live lobster, *Holdfast* is the fourth 20+ m lobster boat in as many years to be designed by Southerly Designs, joining *Ohana* (2015), *Daydawn* (2016), and *Gambler* (2017).

Holdfast at sea during trials
(Photo courtesy Dongara marine)

Although not the lead builder for the *Daydawn* and *Gambler* projects, Dongara Marine played a key role as the manufacturer of their resin-infused composite wheelhouses. The weight, noise and temperature insulation, finish, and maintenance advantages which these wheelhouses have over conventional aluminium or fibreglass structures are driving their popularity with both fishing and work-boat operators.

Fittingly for a boat which has been both designed and built in Port Denison in Western Australia, the Cockman family which owns *Holdfast* is also from Dongara in the mid-west of Western Australia. Following in the footsteps of their father who began in the industry some 50 years ago, brothers Bruce and Jeff Cockman have literally been around the fishing industry their whole lives. They will both take turns skippering the new boat.

The big live tank capacity — up from 4.5 t on the Cockmans' previous fleet flagship — is critical to bringing in product which will attract the highest price. *Holdfast* is equipped with a Maretron system for tank level and flow monitoring.

Based on seeing *Daydawn* in action and their experience with their Southerly Designs 20 m *Safari* (built for them in 2003), the Cockmans had no hesitation in returning to the renowned design firm for the new boat.

Keeping the project local, including the economic benefits for their hometown, was one key factor in the Cockmans selecting Dongara Marine as the builder.

With highly-experienced management, bigger facilities, and a larger, more diverse workforce, Dongara Marine has quickly grown the capacity and capability to take on the lead role for larger projects. Accordingly, it took the role of prime contractor for *Holdfast*, which is the first newbuild to come from the larger shed which the company upgraded to last year.

Demand for Dongara Marine's boatbuilding, refit, and specialist composite-manufacturing services meant, however, that fabrication of *Holdfast's* aluminium hull was subcontracted to Niche Marine in order to meet project timelines.

In addition to fabricating and installing the composite wheelhouse, Dongara Marine undertook all engineering and fitout, acid sealing and painting, electrical work, installation of the Windows West windows, and project management of all the specialist subcontractors who contribute to building a vessel of this size and complexity.

With overall and measured lengths of 25.95 m and 23.95 m respectively, the new Southerly Designs monohull shares its hullform with last year's *Daydawn*.

Compared to *Daydawn*, the wheelhouse on *Holdfast* extends further aft to provide more protection for the crew when working at the pot hauler, tipper and main cray tanks. This design change also results in a larger flybridge.

Within the wheelhouse, the port-side helm station reflects the increasing levels of technology available to fishermen. Two large (107 cm) flat screen multi-function displays enable the skipper to access information of a variety of types and sources. These include navigation information from the MaxSea system, Furuno radar, and Furuno AIS, vessel monitoring through CCTV, and data directly supporting fishing including that from the Smart Catch system and the WASSP multi-beam sonar system. Also fitted are a Furuno 1150 echo sounder and Simrad AP70 autopilot. The electronics were supplied by Geraldton Marine Electronics.

Also drawing power from the boat's two Yanmar 25 kVA gensets are arrays of external lights. These include a huge bank of forward-facing LED Stadium floodlights, deck lights, as well as underwater lights. All the navigation lights are Hella.

Having had electronically-controlled engines in previous boats, the Cockmans were attracted to the simplicity of Yanmar's mechanically-controlled 6AYM-WGT main diesels. Supplied and installed by Brand Mechanical Services, each of the two engines is rated at 680 kW, giving a cruising speed of 18.5 kn, exceeding the expected 17 kn, and a top speed of 23.5 kn. Pro Marine supplied the boat's five-bladed, 990 mm Teignbridge propellers, which are driven via ZF 2000 gearboxes.

The twin props, dual pintle-hung rudders, and a Side Thrust tunnel bow thruster provide excellent manoeuvring capabilities at all speeds.

While home ported in Port Denison, *Holdfast* is capable of fishing the length of the west coast. She has tanks for 8000 L of fuel, ensuring a range of 600 n miles, and is in NSCV class 2B survey for operations up to 200 n miles offshore with as many as 12 people on board. Combined with the huge work deck, this provides flexibility to take on other roles, such as offshore support, in the future or when the quota allocation has been exhausted.

The below-decks accommodation includes a three-berth cabin forward, aft of which is a four-berth cabin, with extra-wide berths on bottom of the two bunk-style arrangements, plus one double (actually queen) cabin and a two single-berth cabins. A large U-shaped settee/mess is located on the starboard side of the wheelhouse, directly forward of the comprehensively-equipped galley.

Dongara Marine used their expertise in sound insulation to ensure that all the wheelhouse and accommodation areas are very quiet, with 71dB at full throttle being the result and, of course, lower at cruising revs. Noise is very tiring on boats, so a great deal of effort was expended to achieve this result.

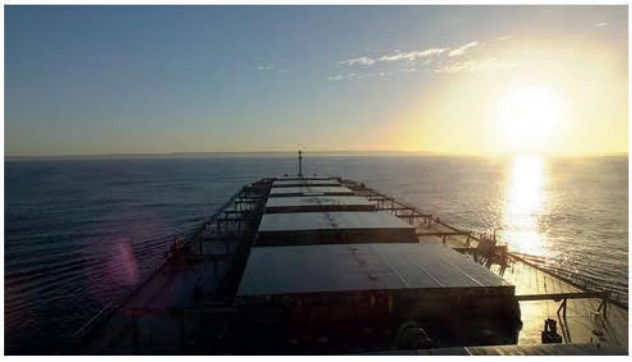
With *Holdfast* delivered, Dongara Marine is turning its attention to other projects. These include construction of a similarly large lobster boat, a Berkeley-class pilot boat, refit and repair work, and some smaller work boats.

First Baby-cape Iron Ore Carrier for Geraldton

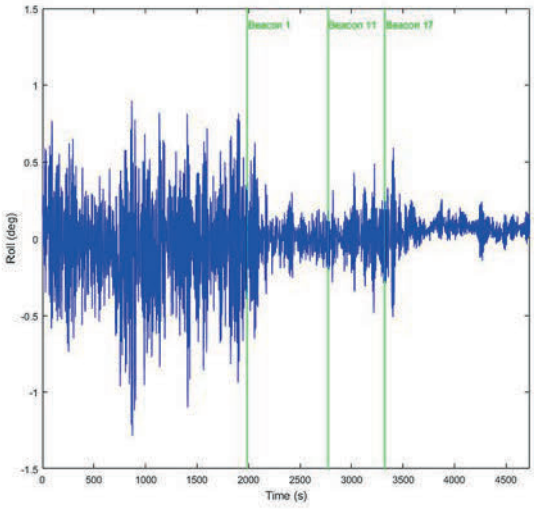
On 14 March 2018, Geraldton Port had its first visit from a baby-cape iron-ore carrier. At 43 m beam, these ships are much wider than the 32 m beam Panamax and 38 m beam post-Panamax bulk carriers which normally use the port. Advance planning was required to ensure that the ship would be able to safely transit the 180 m wide channel and its 110 degree turn. Shiphandling simulations were conducted by Geraldton pilots at the Fremantle Maritime Simulation Centre, overseen by Neil Lawson, with ship hydrodynamics assistance from Perth Hydro.

Following the successful simulations, the first ship pilotage was done with two pilots, in daylight hours and low swell conditions. The Japanese-built vessel handled very well both in simulation and in practice. For the loaded outbound transit, OMC International's new-generation UKC software was used to calculate the tidal window.

Tim Gourlay



MV *Rising Sun* (appropriate name) inbound to Geraldton
(Photo courtesy Tim Gourlay)



Measured roll during MV *Rising Sun* inbound transit
(Image courtesy Tim Gourlay)

Kilimanjaro VII from Incat Crowther

Incat Crowther has announced the design of a 45 m catamaran passenger ferry for Azam Marine of Tanzania, Africa. This vessel is the tenth vessel designed by Incat Crowther for the operator, and will be the seventh vessel built for the operator by Richardson Devine Marine.

The 500 passenger, 35 kn vessel features the operator's trademark parallel boarding system, whereby five ramps per side load passengers and cargo in segregated flows. VIP and Royal-class passengers board directly into a discreet stair tower to the upper-deck cabin, whilst economy passengers load separately aft and midships. The fifth ramp is dedicated to luggage-trolley movements. The boarding system ensures that passenger classes and luggage trolleys don't mix, reducing turnaround time and improving safety, whilst promoting exclusivity for the higher-yield passengers.

The vessel seats 247 passengers in its main-deck economy cabin, 72 VIP passengers and 24 Royal-class passengers on the mid deck, with the remainder being economy passengers in separate areas over three decks. A major enhancement from earlier vessels is the relocation of the wheelhouse to the third deck. This results in panoramic windows forward on the mid deck, creating a class-leading experience for occupants of this high-revenue space.

Although this is the first fast passenger vessel to use a pair of Cummins QSK95-M main engines, Incat Crowther is already familiar with this model, having utilised them in several recent offshore vessels which are now in service. In this specific project, the large twin-engine solution is an effective way of providing more speed whilst avoiding the through-life cost and complexity of a four-engine power train. Engine room accessibility is improved over a four-engine arrangement, and maintenance and operational requirements are less. Additional dividends are realised in the routing and a reduction in the duplication of systems.

This latest design further demonstrates the deep operational understanding which Incat Crowther shares with its clients. Part of Azam Marine's enormous success has been based on the vessels being efficient, reliable and simple to maintain, a crucial trait in the region.

Port quarter of *Kilimanjaro VII*
(Image courtesy Incat Crowther)

Principal particulars of the new vessel are

Length OA	45.1 m
Length WL	42.9 m
Beam OA	11.5 m
Depth	4.25 m
Draft (hull)	1.50 m
Passengers	500
Crew	8
Fuel oil	18 600 L main tanks 4000 L day tanks
Fresh water	2000 L
Sullage	3000 L
Main engines	2×Cummins QSK95-M each 2684 kW @ 1700 rpm
Propulsion	2×KaMeWa 80-S4 waterjets
Generators	2×Cummins 6-CP 136DM/5
Speed (service)	30 kn
(maximum)	35 kn
Construction	Marine-grade aluminium
Flag	Tanzania
Class/Survey	DNV GL and NSCV Class 1C

Julia Leigh from Incat Crowther

Incat Crowther has announced that a second catamaran ferry is under construction at Gladding Hearn Shipbuilding in Massachusetts for Rhode Island Fast Ferry. The vessel, to be named *Julia Leigh*, will expand on the success of the 2012-delivered *Ava Pearl*, meeting increased passenger demand and adding a new route to RIFF's operation. Carrying 320 passengers, the vessel will offer more than twice *Ava Pearl*'s passenger capacity.

Large boarding areas port and starboard lead directly into the main-deck cabin, as well as stairs to the upper deck. The main-deck cabin seats 142 passengers facing forward throughout the centre, and at tables adjacent to the windows. In addition, there are four wheelchair spaces.

At the aft end of the cabin are three toilets, including one which is fully-accessible. Ahead of this is a large bar and shop. The forward end of the cabin has large doors to access the foredeck and forward boarding area.

The upper passenger deck is divided into two zones. The forward zone is enclosed around three sides and seats 61 passengers. The aft portion of the cabin features 74 open-air seats.

Starboard bow of *Julia Leigh*
(Image courtesy Incat Crowther)

The roof deck has capacity for 60 passengers for external viewing in good weather, with 18 seats.

Luggage racks are fitted across the aft end of the main deck, with dedicated side gates to allow crew to safely load luggage independent of passenger movements. Additional luggage storage is provided on the foredeck.

The superstructure sits on resilient mounts to reduce the transmission of noise and vibrations.

The vessel utilises Incat Crowther's 'S bow' hulls which have demonstrated improved passenger comfort in the sea conditions typically encountered in the region. Powered by a pair of MTU 12V4000 M64 engines, each producing 1398 kW, the vessel will have a loaded service speed of 27 knots.

Principal particulars of *Julia Leigh* are

Length OA	33.1 m
Length WL	32.5 m
Beam OA	9.65 m
Depth	3.80 m
Draft (hull)	1.75 m
(propellers)	2.36 m
Passengers	320
Crew	4
Fuel oil	8841 L
Fresh water	1703 L
Sullage	1968 L
Main engines	2×MTU 12V4000 M64 EPA Tier 3 each 1398 kW @ 1800 rpm
Propulsion	2×fixed-pitch propellers
Generators	2×Cummins Onan 55MDDCB 55 kW
Speed (service)	27 kn
(maximum)	29 kn
Construction	Marine-grade aluminium
Flag	USA
Class/Survey	USCG Subchapter K

Stewart Marler

City Jet 1 and *City Jet 2* from Incat Crowther

Incat Crowther has announced the delivery of *City Jet 1* and *City Jet 2*. The 28 m passenger ferries are part of a six-vessel new-build program for the Cancun-based operator, Ultramar, in Mexico. The vessels will operate at high frequency across the enclosed lagoon adjacent to Cancun, thereby sparing

tourists a notoriously-lengthy bus trip and reducing travel times by up to 70%. The ferries were built by Midship Marine in Harvey, Louisiana.

The main-deck cabin can accommodate 118 passengers in high-end seating. Sliding doors are fitted at both the forward and aft ends of the cabin for ease of access. The aft deck features a bathroom, electrical closet, standing room for passengers, and plenty of room for luggage. Also featured on the aft deck is a raised engine hatch, increasing maintenance space in the engine room. As with all other Ultramar boats designed by Incat Crowther, the vessels are fitted with forward and aft hinged boarding ramps on both sides which facilitate rapid loading and unloading.

The pilothouse sits on a raised platform, affording good visibility over the bow. The roof deck features 140 external passenger seats with room for emergency life floats.

The low-draft vessel is powered by two Yanmar 6HYM-WET engines driving fixed-pitch propellers for a service speed of 22 kn at 85% MCR.

The addition of *City Jet 1* and *City Jet 2* to Ultramar's fleet rewards Incat Crowther's attention to servicing the client's needs. By being tailored to a specific set of operational requirements, these new lagoon vessels will be reliable and profitable.

Principal particulars of the new vessels are

Length OA		28.0 m
Length WL		27.7 m
Beam OA		7.50 m
Depth		2.00 m
Draft	(hull)	0.95 m
	(propellers)	1.20 m
Passengers		300
Crew		2
Fuel oil		2000 L
Fresh water		250 L
Sullage		1000 L
Main engines		2×Yanmar 6HYM-WET each 441 kW @ 2100 rpm
Propulsion		2propellers
Speed	(service)	22 kn
	(maximum)	25 kn
Construction		Marine-grade aluminium
Flag		Mexico

Ben Soileau

City Jet 1 outbound from Cancun
(Photo courtesy Incat Crowther)

Inclinings of MYs *Shadow*, *Sirenia* and *The Star* by John Butler Design

As accredited AMSA surveyors, John Butler Design (JBD) is regularly engaged to conduct various types of survey work, from plan approval through to periodic surveys and inclining experiments.

For motor yachts *Shadow*, *Sirenia* and *The Star*, JBD was required to conduct an inclining experiment to derive the lightship particulars in order to then define the operating passenger (and diver for *Sirenia*) limitations to ensure class compliance for passenger vessel operations on Sydney Harbour. This was achieved by generating a 3D model and assessing the loading conditions in accordance with the applicable NSCV criteria.

MY *Shadow*
(Photo courtesy John Butler Design)

Contender 25 Stability Proof Test and Class Survey

Wallrock Marine imported a Contender 25, an American-designed monohull, which the owner intended to use as a fishing charter vessel capable of restricted offshore fishing operations.

In order to achieve compliance with survey requirements a lightship comparison survey was undertaken to confirm that the vessel was as per the design, and was similar to a sister vessel built some years earlier. A survey of navigation and safety equipment was also carried out as part of the process.

Contender 25
(Photo courtesy John Butler Design)

Vanta Survey

The landing craft *Vanta*, formerly owned by BP, was brought to Sydney Harbour from Queensland. The owner wanted to re-purpose the vessel as a general cargo transport vessel and work boat for the local waterways around Sydney Harbour.

This required full survey to ensure that the safe working capacity of the vessel complied with AMSA requirements for Domestic Commercial Vessels. The safe operating envelope of the crane was developed in conjunction with the safe working loading capacities using a 3D model generated from the lines plan. The operating loading conditions were assessed in accordance with the relevant NSCV criteria and found to be compliant.

MV *Vanta*
(Photo courtesy John Butler Design)

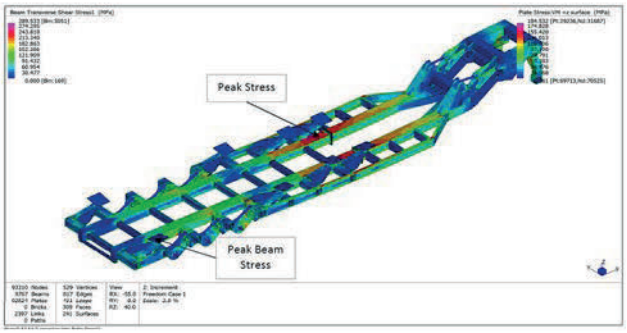
LLC Transport Trailer

Noakes Group acquired a versatile trailer which they wished to use for moving the LHD Landing Craft (LLC) vessels.

The trailer itself comprises of a series of pads which are hydraulically raised to meet and support the hull of any vessel. The trailer required additional strengthening in particular areas due to the nature of the LLC hull form and their mass. Given the complexity of the trailer, its U-shape design and its lifting arrangement, a site visit was undertaken to confirm the structural and mechanical details of the trailer. These details along with the technical drawings were then used to create a detailed finite-element analysis model. Loads were applied to each support pad and the trailer was assessed for peak stresses.

JBD was then able to provide Noakes with a detailed refit plan of the work required to strengthen the trailer and make it fit for purpose.

Noakes' trailer for the LLC
(Photo courtesy John Butler Design)



LLC trailer FEA model
(Image courtesy John Butler Design)

STS *Young Endeavour* and LLC Inclining Experiments

JBD has enjoyed a long and successful relationship with the Department of Defence (DoD) and The Navy Technical Bureau (NTB), having carried out many surveys across a range of vessels. Most recently, STS *Young Endeavour* and an LHD Landing Craft required inclining experiments to renew their trim and stability books.

STS *Young Endeavour* was successfully inclined recently at Noakes Boat Yard, returning predictable results for the NTB. JBD was familiar with the vessel, having inclined her before; the inclining process was carried out with NTB representatives over two days in good conditions.

The LHD Landing Craft inclining test was conducted at HMAS *Kuttabul* in Sydney, and proved to be a successful experiment with negligible changes to the vessel's derived lightship particulars, LCG, TCG and VCG.

John Butler

STS *Young Endeavour*
(Photo courtesy John Butler Design)

LHD Landing Craft 4402 berthing ahead of HMAS *Darwin*
(Photo courtesy John Butler Design)

Cruising in NSW

The summer season continued through late February with visits by *MS Regatta, Voyager of the Seas, Seven Seas Navigator, Seabourn Odyssey, Crystal Symphony, Crystal Serenetiy, Ovation of the Seas, Silver Whisper, Sun Princess, Seven Seas Voyager, Norwegian Jewel, Explorer of the Seas, Artania, Pacific Explorer, Seabourn Encore, MS Columbus, Arcadia, Queen Mary 2, Pacific Jewel, Celebrity Solstice, Queen Elizabeth* and *Black Watch.*

The season wound down through autumn, with return visits in March by many of these vessels plus visits by *Carnival Spirit, Noordam, Diamond Princecss, Costa Luminosa, L'Austral, Azamara Journey, Sea Princess, Radiance of the Seas* and *Carnival Legend.* April saw return visits by some of these vessels and added visits by *Pacific Eden,* while May saw return visits by some of these vessels and added a visit by *MS Insignia.*

Carnival Spirit, Pacific Eden, Pacific Explorer, Pacific Jewel, and *Sun Princess* are scheduled for cruises over the winter months, the increasing number (up from two a few years ago) being indicative of the increasing demand for winter cruises. The arrival of *Majestic Princess* on 15 September and *Radiance of the Seas* on 10 October will signal the start of the next summer season.

Phil Helmore

Celebrity Solstice at anchor in Athol Bight, Sydney, on 25 February 2018
(Photo John Jeremy)

Hydrodynamics of High-Performance Marine Vessels
Second Edition

Emeritus Professor Lawrence Doctors

Emeritus Professor Lawrence Doctors has recently completed the second edition of his book *Hydrodynamics of High-Performance Marine Vessels* describing the hydrodynamics of all types of high-speed marine vehicles. The new edition is slightly longer, with a total page count of 939. The book differs from the first edition in that small amounts of up-to-date information have now been included in the relevant chapters.

The two volumes of the book may be accessed from the Amazon.com website at

http://www.amazon.com/dp/1984390910 and
http://www.amazon.com/dp/198439102X

An example of an update which will be of interest to naval architects who design planing boats is the comparison of the well-known Savitsky (1964) method of predicting the hydrodynamic performance of these craft with the much-less-well-known Russian approach which has been called the Lyubomirov (1944) method. This is also called the method of the Central Aero-Hydrodynamic Institute (CAHI) in Moscow, and is based on the research described by Perelmuter (1938). These two semi-empirical methods are described in Chapter 11 of Doctors' new book.

There are two principal differences between the two methods. In the Savitsky method, the formula for the hydrodynamic lift indicates that it is proportional to the trim angle raised to the power 1.1, while the Lyubomirov method predicts that the lift is simply proportional to the trim angle. The latter result is in keeping with linear hydrodynamic theory and therefore seems to be more appropriate. However, a comprehensive comparison between the predictions with the available towing-tank experimental data, published in Doctors' new book, shows that both methods possess an extremely high coefficient of determination R^2 (fit to the data) and that there is no significant predictive difference.

The second difference between the two methods is that, in the Savitsky method, one assumes the equilibrium planing angle (trim angle) and then proceeds to compute the forces acting upon the craft. It is then necessary to iterate the trim angle until the boat is in equilibrium. On the other hand, in the Lyubomirov method, the average wetted length is assumed and it is this wetted length which is iterated in order to achieve equilibrium.

A comparison of the effectiveness of these two semi-empirical methods is reproduced in the figures here. The model planing boat is the Australian Maritime College Model 87-02. The body plan for this small 6.000 kg displacement model is shown in Figure 1.

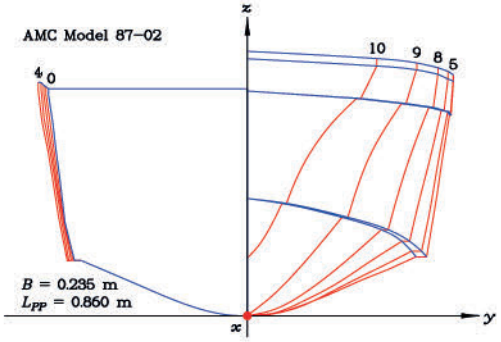


Figure 1: Body plan AMC Model 87-02
(Drawing courtesy Lawry Doctors)

Five sets of experimental data for the transom draft are plotted in Figure 2. The total resistance is rendered dimensionless against the weight of the model and is shown as a function of the beam Froude number. These data were collected by students from The University of New South Wales (now UNSW Sydney) who were hosted for their towing-tank work at the Australian Maritime College.

Two versions of the Lyubomirov method are considered. The first version is the original method, while the second version (indicated with an asterisk) is a modification which was proposed by Almeter (1993). In the original method, one is supposed to apply a correction to the planing length to allow for the effect of deadrise angle (18.25 degrees in this example). This correction to the wetted length is not applied in the modified implementation. The graph shows that there is only a small difference between the resistance predictions of the Lyubomirov (both implementations) and the traditional Savitsky method.

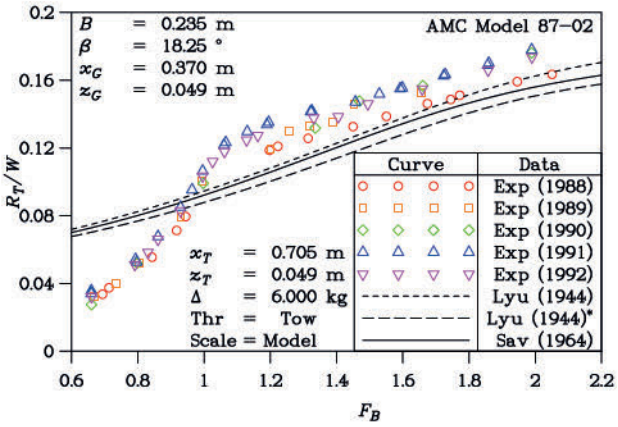


Figure 2: Total Resistance
(Diagram courtesy Lawry Doctors)

The transom draft is presented in Figure 3. The transom draft is rendered dimensionless against the beam. It is demonstrated here that the prediction of the modified Lyubomirov method is much superior to that of the unmodified method and it is almost identical to that of the Savitsky method.

Lastly, the predictions for the trim angle in degrees is presented in Figure 4. It is seen in this plot that the two Lyubomirov implementations provide essentially the same result for the trim and that these are slightly lower than the Savitsky prediction, more in keeping with the experimental data.

It is noted that the model is not purely prismatic in form. Hence, one would not expect to obtain perfect agreement between the tank data and the semi-empirical methods discussed here. This is because the methods are based on towing-tank data for strictly prismatic surfaces. That data was published by Savitsky and Neidinger (1954). The reader can also consult Alourdas (2016) who has published a very clear exposition of the Lyubomirov method.

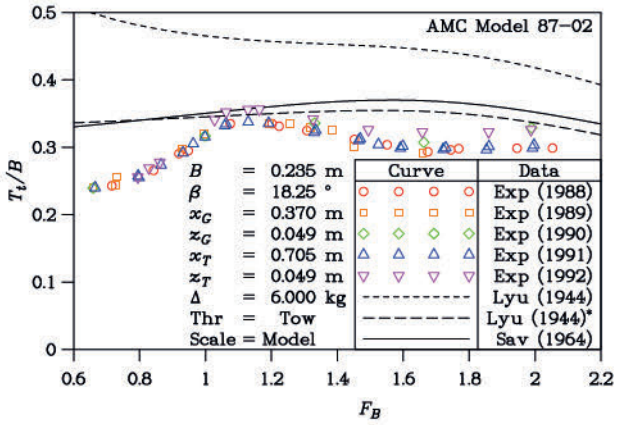


Figure 3: Transom Draft
(Diagram courtesy Lawry Doctors)

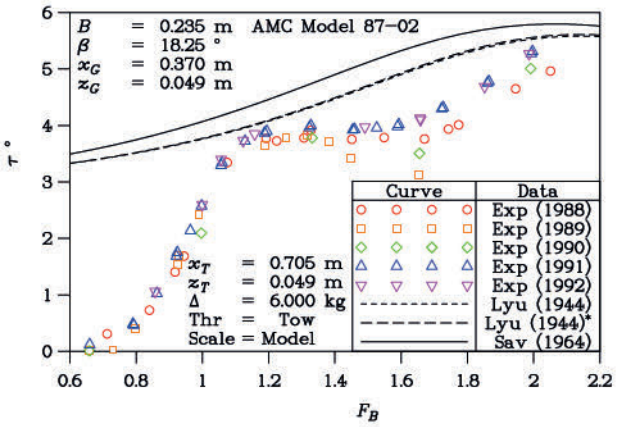


Figure 4: Trim Angle
(Diagram courtesy Lawry Doctors)

The author would like to take this opportunity to express his appreciation for the assistance of the Australian Maritime College in performing the experiments on the described planing-boat model in a most efficient manner.

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MODERN MARINE ARCHAEOLOGY

Indian Ocean Shipwrecks Identified

Two shipwrecks discovered 2300 km off the coast of Western Australia during the initial search for missing Malaysia Airlines flight MH370 have been identified as 19th Century merchant sailing vessels carrying cargoes of coal.

The sites provide tangible archaeological evidence for use of the historic Roaring 40s trade route for ships between Europe, North America, Australia, New Zealand, India, Southeast Asia, China and Japan.

The Western Australian Museum was asked by the Australian Transport Safety Bureau (ATSB) to analyse sonar and video data taken in international waters by the search vessels *Fugro Equator* and *Havilah Harmony* in May and December 2015. The work was undertaken by Dr Ross Anderson, Curator of Maritime Archaeology at the WA Museum.

"Both wrecks were found at depths between 3700 and 3900 metres, roughly 36 km apart. We used a combination of all of the data supplied by ATSB, historical research and maritime archaeological analyses to determine that both wrecks were, in fact, 19th Century merchant sailing ships — one wooden (designated IOS-001) and one iron (designated IOS-002) — both carrying coal," Dr Anderson said.

Dr Anderson said that the wooden sailing ship would have been in the 225–800 t range. None of the hull structure or loose ship's timbers were observed at the site, appearing to have totally decomposed, leaving only the remains of the vessel's coal cargo and metal objects such as fastenings, anchors and fittings.

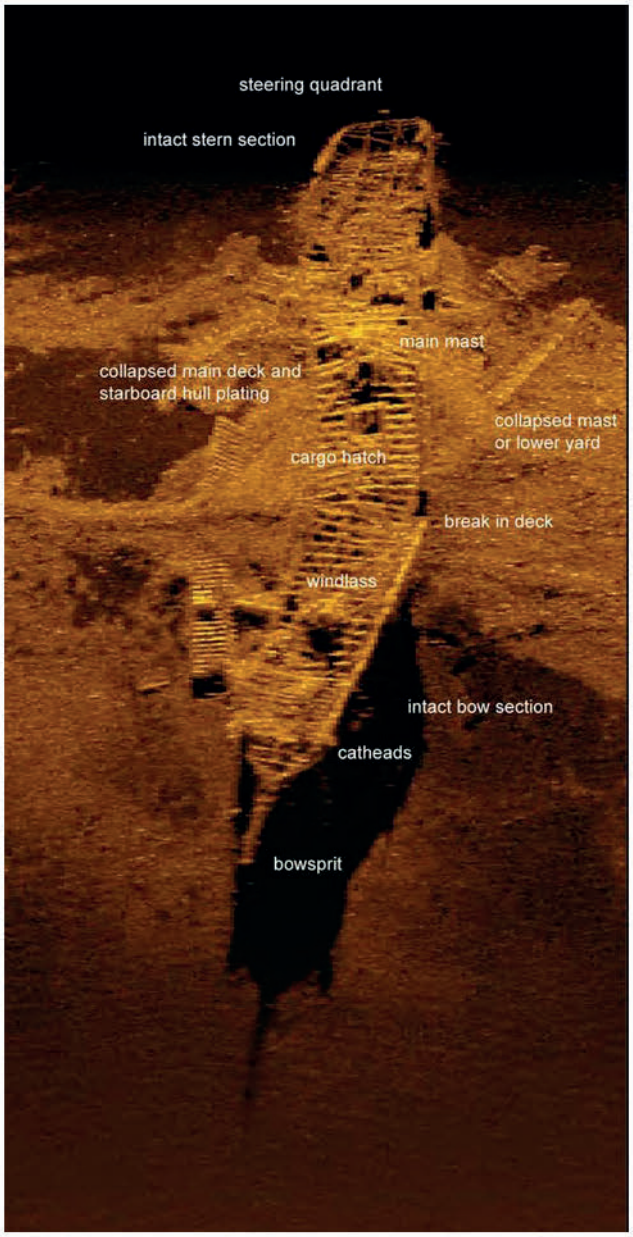
A three-dimensional model of part of the IOS-001 wreck site
(Image Australian Centre for Field Robotics, University of Sydney)

"Most of the material widely scattered on the seabed consists of the remains of the coal cargo which spilled out of the hull prior to it striking the seabed," Dr Anderson said. "The evidence points to the ship sinking as a result of a catastrophic event such as explosion, which was common in the transport of coal cargoes.

"One very interesting find was a large rectangular metal object of 6 m in length, which was the biggest feature discovered on the site. This was identified as a ship's iron water tank."

The second wreck was more intact, lying upright on the seabed. Sonar and video images enabled it to be identified as an iron sailing ship with at least two decks, of between

An Admiralty type anchor with iron stock at the IOS-001 wreck site
(Image Fugro/ATSB)



A high-resolution sonar image showing the
key features of wreck IOS-002
(Image Fugro/ATSB/WA Museum)

1000 and 1500 tons. Deck rails and stanchions on the bow and portholes at the stern were visible.

"Historical research into all 19th Century merchant ships which disappeared in international waters is incomplete, so we cannot conclusively determine the identity of the individual ships," Dr Anderson said. "However, we can narrow the possibilities to some prime candidates based on available information from predominantly British shipping sources.

"For the wooden ship the brig *W. Gordon* and the barque *Magdala* are two possible candidates; for the iron ship the barques *Kooringa* (1894), *Lake Ontario* (1897) and *West Ridge* (1883) are possible, with the *West Ridge* best fitting the evidence."

Both ships are likely to have carried crews of between 15 and 30 men. Sometimes captains travelled with their wives and children on international voyages and both vessels may have carried additional passengers as well as cargo.

"Then, as now, the disappearance of so many lives would have had a devastating impact on maritime families and communities," Dr Anderson said.

The Western Australian Museum's report on the analysis of the shipwrecks can be found on the Museum's website at http://museum.wa.gov.au/maritime-archaeology-db/No-322-MH370-analysis

The starboard side of the bow of IOS-002 with intact deck rails,
beak-head and bowsprit
(Photo ATSB)

Donker boiler and machinery in IOS-002
(Photo ATSB)

Manual bilge pump and lead piping in IOS-002
(Image ATSB)

HMAS *AE1* Revisited

A joint US and Australian expedition in early April to survey Australia's first submarine, HMAS *AE1,* has provided detailed new images of the 103-year old shipwreck, which lies on the sea floor off the Duke of York Islands in Papua New Guinea (PNG).

The Royal Australian Navy's HMAS *AE1* was lost at sea with all hands on 14 September 1914, and its fate had remained a mystery until its discovery in December 2017. It was the first loss for the RAN and the first Allied submarine loss in World War I but, ultimately, a tragedy felt by all Australians.

The recent survey was undertaken by Microsoft co-founder Paul Allen's research vessel *Petrel* and coordinated by Find AE1 Ltd. in partnership with the Australian National Maritime Museum, the Royal Australian Navy, Curtin University, the Western Australian Museum and the Submarine Institute of Australia. Approval for the survey was granted by the Papua New Guinea National Museum and Art Gallery. The ship's remotely-operated vehicle (ROV), fitted with high-definition video and stills cameras, undertook a comprehensive, non-invasive inspection of the submarine, revealing fascinating new information.

RV *Petrel*
(Photo credits at end of article)

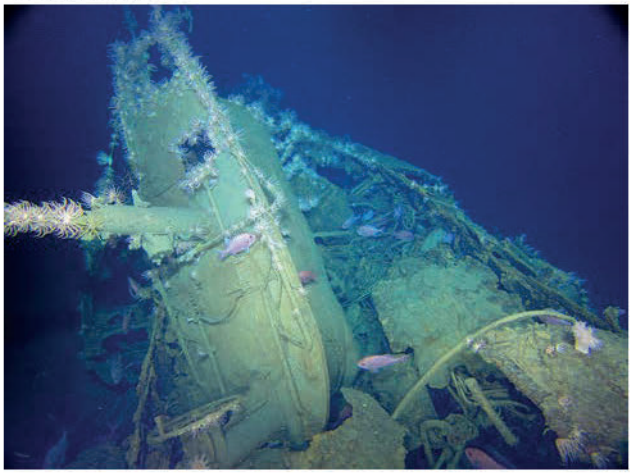
Inside the control room of *Petrel* during the inspection of *AE1's* aft torpedo tube

RV *Petrel* diverted to the Duke of York Islands following a series of successful expeditions which located the World War II shipwrecks of USS *Lexington*, USS *Juneau* and USS *Helena*.

"*AE1* has a special place in Australian maritime history and I'm proud of our partnership with the Australian National Maritime Museum and others who brought an end to the mystery of the *AE1's* final resting place," said Paul Allen. "For all of us associated with *Petrel*, we view this work as a means to honour the courage and sacrifice of the crew of the *AE1*."

The data collected during this first ROV examination of *AE1* will be used by the Australian National Maritime Museum to develop a shipwreck management plan in cooperation with the PNG Government and the PNG National Museum and Art Gallery.

"We are very grateful to Paul Allen, Vulcan Inc., and the crew of RV *Petrel* for making this survey possible. These incredible images and the new information which they provide will help the museum tell the story of *AE1* and its brave crew, and ensure that their service and sacrifice are remembered by future generations," said Australian National Maritime Museum Director and CEO, Kevin Sumption PSM.



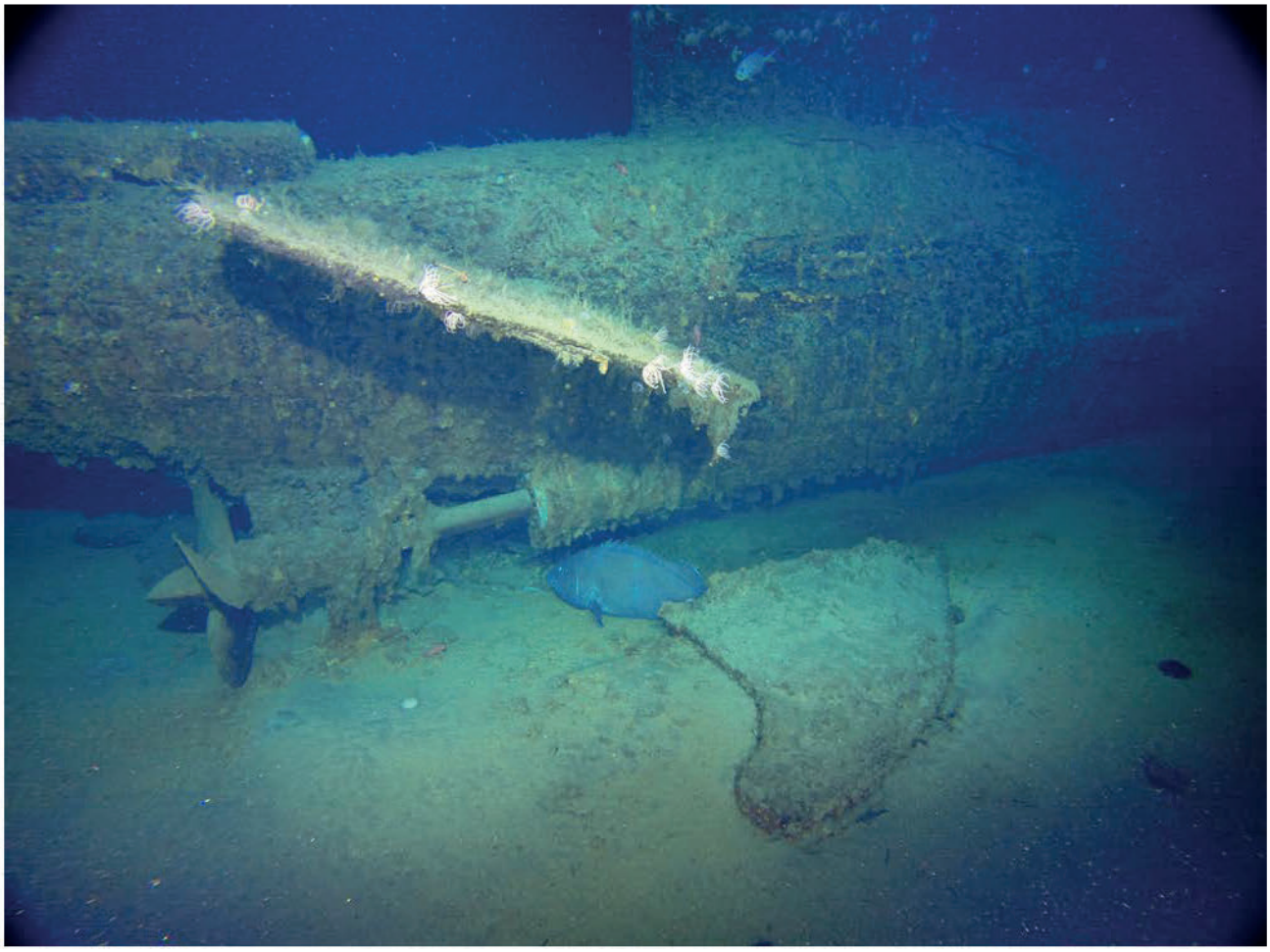
The fin (conning tower) of *AE1* lying collapsed into the wreckage of the imploded control room

The still images of the shipwreck site will also be developed into a detailed 3D digital model using techniques developed by Curtin University and the Western Australian Museum. This will allow the Find AE1 team and museum researchers to further examine *AE1* and refine understanding of what happened to it 103 years ago.

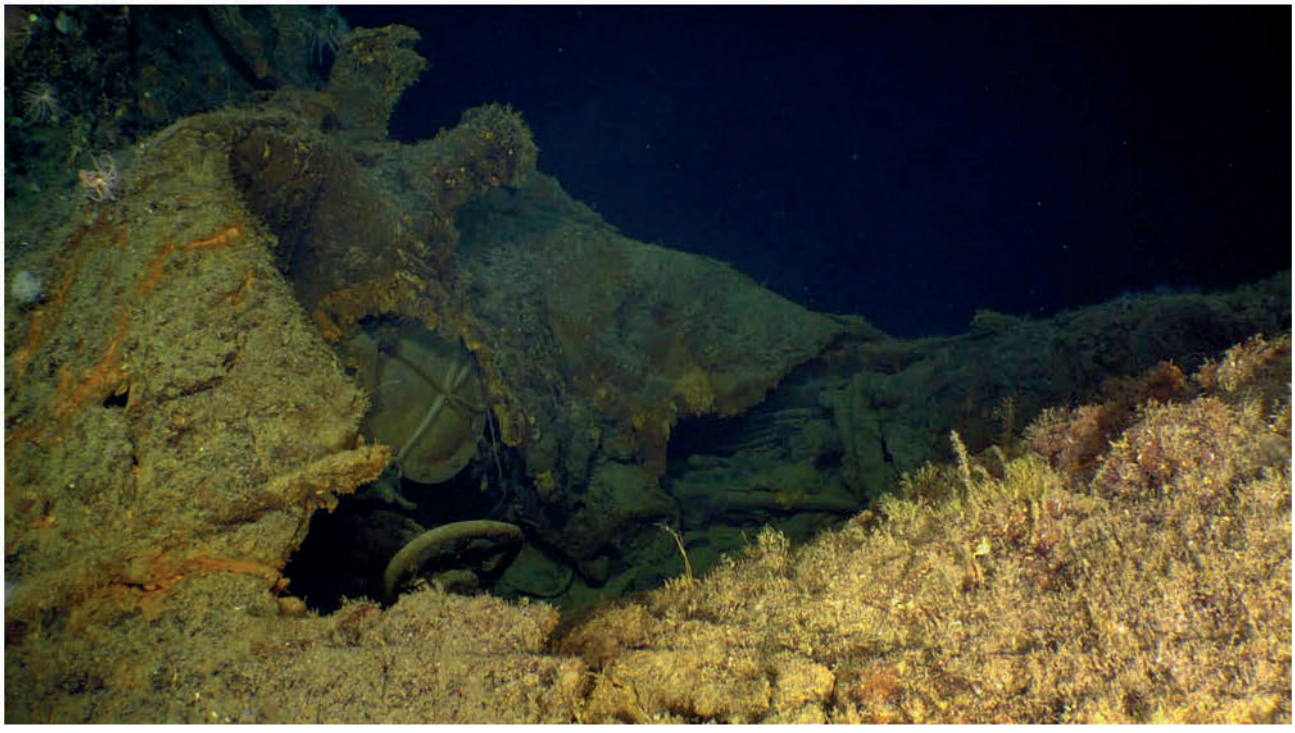
AE1 was located on 19 December 2017. Images and other data collected on that occasion were used to understand what probably happened on 14 September 1914. A report entitled *HMAS* AE1, *Finding the Men of* AE1 — *20 December 2017* was published by Find AE1 and the ANMM in January 2018. The report concluded that the most likely cause of *AE1's* loss was a diving accident. The submarine apparently experienced a depth excursion and exceeded its crush depth, leading to the implosion of the hull forward of the fin in the control room area and over the forward torpedo compartment. The crew would have died instantly and the submarine would have sunk rapidly to the bottom.

The high-quality images obtained during the latest visit to the wreck are providing greater detail of the submarine as she now lies and a further report on the sinking will be published in due course.

(All images courtesy Paul G. Allen, Find AE1, Australian National Maritime Museum and Curtin University, © Navigea Ltd)



The starboard propeller, aft hydroplane and hydroplane guard (detatched and on the sea floor) of *AE1* with resident grouper
(Photo credits at end of article)



The imploded forward torpedo compartment of *AE1*. The rear door of the forward torpedo tube can be seen on the left. The submarine lies at a depth of over 300 m, well below the submarine's crush depth

EDUCATION NEWS

Naval Shipbuilding College Progress

On 3 April 2018 the Minister for Defence Industry, the Hon. Christopher Pyne MP, the Minister for Education and Training, Senator the Hon. Simon Birmingham, and the Assistant Minister for Vocational Education and Skills, the Hon. Karen Andrews MP, announced that the Naval Shipbuilding Institute, a joint venture between Kellogg Brown & Root and Huntington Ingalls Industries, had been selected as the preferred tenderer to develop the Naval Shipbuilding College.

The Naval Shipbuilding College will be established and managed by the Naval Shipbuilding Institute to work with shipbuilders to understand their workforce requirements throughout the different stages of project construction and sustainment, while leveraging a national network of education and training providers to deliver the specific skills required.

Minister Pyne said that the Naval Shipbuilding Institute (NSI) team represents over 200 years of commercial experience in naval shipbuilding education and skilling.

"The NSI team has a proven track record of developing shipbuilders and will bring to Australia their collective experience in naval shipbuilding skilling and education," Minister Pyne said.

"The Naval Shipbuilding College will collaborate with key education and industry providers to ensure that Australia can increase the size and skill level of the naval shipbuilding and sustainment workforce which we need.

"More than 25 000 personnel will be needed directly or indirectly for the Government's $90 billion commitment to a continuous shipbuilding program. The naval shipbuilding workforce in Australia is likely to grow to around 5200 workers by the mid-2020s, across a range of diverse job roles."

By the mid-2020s it is estimated that the:

- outfitting workforce — people like electricians, joiners etc. — will need to grow by more than 1400 people;
- structural workforce — boilermakers, and steelworkers — will need to grow by more than 1000 people, and
- management staff will grow by more than 300.

Minister Birmingham said that the Naval Shipbuilding College will be industry-driven to ensure that our future workforce can meet the needs of the naval shipbuilding industry for decades to come.

"The College will work with a range of high-quality education and training providers to build their capacity and ensure that our future workforce can meet the specialised requirements of the naval shipbuilding industry," Minister Birmingham said

"In order to deliver the right skills at the right time the College will need to build strong partnerships, particularly with education and training providers, but also with selected ship designers and builders, and the wider defence industry community,"

Assistant Minister Andrews said that the Naval Shipbuilding College would provide opportunities for education providers across Australia to collaborate in educating and training high-quality candidates for future employment.

"The College will work with a range of high-quality education and training providers across Australia through a 'hub and spoke' model," Assistant Minister Andrews said

"A person could be enrolled at the Naval Shipbuilding College headquartered in Adelaide, but be completing the course at a registered training organisation or higher education provider in Perth, Sydney, Melbourne, Brisbane, Canberra, Hobart, or regional centres such as Launceston."

The Naval Shipbuilding College will be headquartered in South Australia, creating 20 jobs in Adelaide, with an initial focus on increasing the number of people with key entry-level trade qualifications. The Australian partners who have already come on board are:

- The Defence Teaming Centre
- Uiversity of South Australia
- University of Adelaide
- Flinders University
- RMIT University
- Edith Cowan University
- TAFESA
- South Metro TAFE (WA)
- Indigenous Defence Consortium
- Australian Maritime College

Research grant for University of Tasmania

It was announced in February that the University of Tasmania will partner with US universities to conduct research to help improve Australia's naval capability.

The Minister for Defence Industry, the Hon. Christopher Pyne MP, said that this was made possible through a $3 million grant over three years for the University of Tasmania to participate in the Multidisciplinary University Research Initiative (MURI) administered by the US Department of Defence.

"The university's Australian Maritime College will join seven leading US universities in hydrodynamics research, which will assist in developing Australia's ship and submarine capability," Minister Pyne said.

The US academic institutions involved in the hydrodynamics research include the Massachusetts Institute of Technology; Johns Hopkins University; the California Institute of Technology; the University of California; the University of Minnesota; the University of Iowa and the University of Michigan. They will receive funding from the US Office of Naval Research.

The researchers will study the physics of cavitation to enhance our understanding of how this affects the performance of naval vessels. Cavitation is the process where bubbles of water vapour form in the water flowing over a surface, for example, a hull or a propeller, and then collapse. This can cause damage to the surface through the air bubbles imploding and causing erosion, and results in high levels of noise.

The cavitation tunnel can be used to study different hull shapes, propeller profiles and propeller flexibility to determine how they might affect cavitation and thus identify

shapes/flexibility that could reduce cavitation and hence erosion and noise.

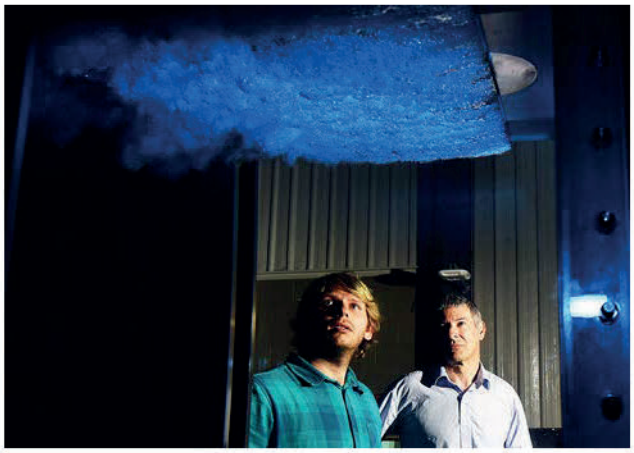
The grant is being provided under the Next Generation Technologies Fund led by the Defence Science and Technology Group.

AMC Interim Principal, Prof. Nataliya Nikolova, said that the experiments would be conducted in the Cavitation Research Laboratory — the only one of its kind in Australia and one of a handful of such experimental laboratories in the world.

"AMC is home to some of the most sophisticated research facilities in the world which allow us to do some of the best maritime-related research in the world," Prof. Nikolova said.

"The suite of facilities which makes up the Cavitation Research Laboratory are recognised internationally as being among the most advanced for their size and quality, and have played an important role in a number of national and international research collaborations with our Defence and industry partners.

"This grant supports the successful research partnership between the University, the Defence Science and Technology Group and the US Office of Naval Research, and will enhance collaborations in ship and submarine research with colleagues from some of the most internationally-respected universities in the United States."



AMC Research fellow Luka Barbaca with Cavitation Research Laboratory Research Leader, Prof. Paul Brandner
(Photo by Scott Gelston courtesy AMC)

Cavitation Research Laboratory Research Leader, Prof. Paul Brander, added "The cavitation tunnel can be used to create experimental conditions which more accurately model the physics of real cavitating and bubbly flows.

"These complex flows can create significant problems including noise, vibration and metal erosion. New results and greater understanding obtained from this research will be used to develop better computational flow models for improved design of ship and submarine propellers and hull shapes."

Minister Pyne said "MURI is a highly successful collaborative US program which brings researchers from different disciplines together to investigate high-priority and complex military problems.

"This is consistent with the intent of the Next Generation Technologies Fund and an excellent example of adding value by leveraging expertise and funding from additional sources."

AMC Research Awarded RINA Prize

A study into reducing the motion and improving the ride comfort of high-speed wave-piercing catamarans has won a leading international maritime research prize.

AMC School of Engineering lecturer and Doctor of Philosophy (Maritime Engineering) graduate, Dr Javad AlaviMehr and his team were awarded the Medal of Distinction for best research paper through the Royal Institution of Naval Architects.

Dr AlaviMehr investigated the response of a high-speed catamaran to an active ride-control system by conducting scale model experiments in AMC's towing tank, based on a 112 m Incat catamaran.

"The operation of high-speed catamarans in large waves can produce significant vessel motions which lead to passenger discomfort, as well as extreme loadings, during full bow immersion and wave-slam impact," he said.

"These large loads and motions can be effectively reduced through the implementation of a ride-control system (RCS) which can significantly reduce the extreme loads sustained by the hull girder and reduce the incidence of motion sickness for passengers on board the vessel."

The model was set up for towing-tank tests in calm water to measure the motions response to ride-control step inputs. Heave and pitch response were measured when the model was excited by deflections of the T-foil and the stern tab separately.

Appropriate combinations of the control-surface deflections were then determined to produce pure heave and pure pitch response. This formed the basis for setting the gains of the ride-control system to implement different control algorithms in terms of the heave and pitch motions in encountered waves.

The findings from Dr AlaviMehr's work provide an insight into the motions control response and form the foundation for future investigations exploring optimal control algorithms.

"The development of an improved ride-control system at model scale can nowbe used as a basis for improving the ride comfort and design of future high-speed wave piercing catamaran vessels," he said.

The paper was published in the RINA 2017 *International Journal of Maritime Engineering*.

Dr Javad AlaviMehr
(Photo courtesy AMC)

University of Western Australia

Prof. Bernard Molin Visits UWA

In early March 2018, Professor Bernard Molin, a well-known researcher in the field of marine hydrodynamics, visited

the Industrial Transformation Research Hub for Offshore Floating Facilities (OFFshore ITRH) at the University of Western Australia (UWA) at the invitation of OFFshore ITRH Chief Investigator, Dr Wenhua Zhao. He spent time with Project Two: The Wave-Structure Interaction Team, as well as giving a public lecture and training course.

Prof. Molin graduated from L'École Polytechnique of Paris in 1974, obtained a Master of Science degree in Naval Architecture from the University of California at Berkeley in 1975, and a PhD in engineering from L'École Nationale Supérieure Maritime de Nantes in 1981. He was awarded the Habilitation à Diriger les Recherches by Aix-Marseille University in 1996. He was a research engineer at the French Petroleum Institute from 1975 through 1994 and was then appointed professor in hydrodynamics at L'École Supérieure d'Ingénieurs de Marseille, now L'École Centrale Marseille.

Bernard was the 22nd Georg Weinblum Memorial Lecturer in 1999–2000. He is the author of the book, *Hydrodynamique des Structures Offshore*, published in French and in Chinese, and of over 150 publications. He has been Editor-in-chief of *Applied Ocean Research* for many years.

Bernard's research activities have been mainly concerned with nonlinear hydrodynamics (drift forces, slow-drift motion, and high-frequency loads and response), and development of computer models for the French offshore industry. Recent involvement has included hydrodynamics of perforated structures, vortex-induced vibrations, slamming, moon-pool and gap resonances, hydroelastic response, sloshing in tanks, and motion coupling, run-up effects and slow-drift excitation.

During his visit, Prof Molin delivered two presentations:

- On natural modes in gaps and moon-pools: This presentation summarised his recent research into the prediction of natural frequencies and loads due to sloshing motions in moon-pools of FPSOs, drilling and construction vessels, as well as in the gaps between two vessels moored side-by-side.
- Third-order effects in wave-body interactions: This presentation showed interesting numerical and experimental work on tertiary wave-structure interactions, which are physically present for highly-reflective structures. These interactions may significantly affect the wave patterns and forces on reflective marine structures, for example increasing the run-up by a factor of two or more over a linear prediction.

Bernard Molin discussing interactions between two rectangular barges
(Photo courtesy Hugh Wolgamot)

Both presentations were well attended by UWA students, researchers and offshore industry professionals, and were followed by interesting discussions. These presentations are in areas of current research interest for UWA, and cooperative research is ongoing in these and other areas of interest for the offshore engineering community.

More information on Prof. Molin's visit and the OFFshore ITRH can be found at http://offshorehub.edu.au/hydrodynamics-guru-bernard-molin-to-visit-the-offshore-itrh/

The OFFshore ITRH is a multi-disciplinary research group jointly funded by industry and the Australian Research Council. The OFFshore ITRH is tackling the critical engineering challenges faced by the next generation of offshore oil and gas projects by creating improved designs and operating procedures in a collaborative manner.

Hugh Wolgamot

University of Newcastle

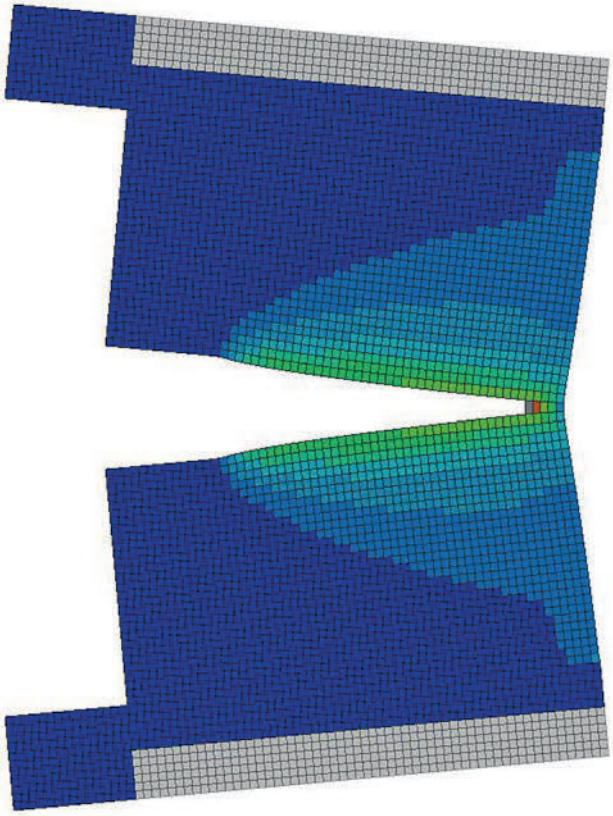
An Australian Research Council (ARC) funded project to develop tools to assist in the management of maritime assets, specifically ships, is well underway. The project, titled *Structural Integrity of Maritime Platforms* (SIoMP), is under the supervision of Prof. Rob Melchers at University of Newcastle (UoN) and Prof. Chongmin Song from UNSW Sydney (UNSW). SIoMP is a multi-disciplinary collaboration between the UoN and UNSW, the Defence Science Technology Group (DST Group) and the Australian technical software provider Pacific ESI, which aims to provide a tool for assessing the survivability of a ship in a known extreme sea state.

The heart of the tool is a finite element (FE) model which provides a very confident picture of the ability of an existing ship to survive a prescribed extreme wave event. The tool sends a detailed FE model of the ship through a wave train which includes the extreme wave of interest. The analysis does not use probabilities; instead the wave of interest is dialled up in the numerical wave tank, the ship driven through that wave and the response of the ship observed. Waves of the height and shape of interest are used with the FE model of the ship which best represents the condition of the ship either now or at some time in the future. The result will be an accurate indicator of the resultant behaviour of the ship in that wave encounter — the FE model will reveal catastrophic failure, structural deformation, or no resultant damage at all. This result can then be used by the ship operator/owner to make a risk assessment on the ship undertaking a specific journey in its current state and will indicate whether repairs should be undertaken immediately, or if a different route with more benign conditions should be chosen.

There are three essential elements to the analysis tool, all using well-proven methods. Firstly, a time-varying stress state can be developed within a ship as it traverses the extreme wave. This relies on proven fluid-structure interaction numerical techniques using FE analysis and Smoothed Particle Hydrodynamics (SPH). Secondly, the FE model of the ship realistically represents the real vessel including details such as cracks in critical areas. This relies on detailed hull surveys or other reports which document

existing defects. Thirdly, the material laws implemented in the FE model allow a crack to propagate under the right stress conditions. This relies on robust material models including the ESI-Wilkins-Kamoulakos (EWK) failure model which is used extensively in the crash simulation of automotive vehicles.

The ability to assess the survivability of the ship in the future relies on existing theories developed by Prof. Melchers and others for the degradation of steels both in sea water and buried in the ground. The experience and data available is vast. The challenge is to bring it together meaningfully for the purpose of predicting the condition of the ship in the future. Once that is done, a prediction of the growth of existing cracks can be made, and the FE model updated to account for the new crack dimensions. Then the limit-state condition analysis can be run again with the 'future' ship conditions. The result will be a prediction about the survivability of the ship in the future.



Images of crack-propagation modelling in the FE program VPS, shown for an edge crack and a centre crack in 10 mm thick steel plates (Image courtesy Pacific ESI)

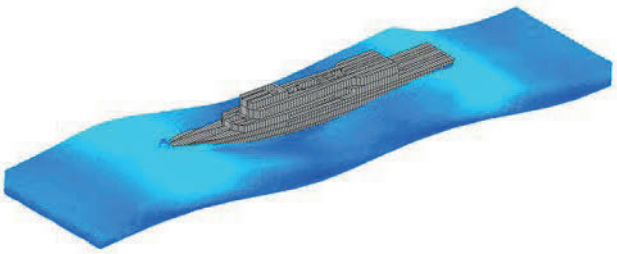


Image of a ship with zero forward speed in a large swell (Image courtesy Pacific ESI)

The project is bringing together existing emerging technologies into a validated package that the maritime industry can use and relate to.

UoN Research Associates, Bruce Cartwright and Dr Lex Mulcahy, are respectively developing the sea-state modelling and proving the metal-failure modelling for the ship steels of interest. Teresa Magoga and Dr Seref Aksu from DST Group are providing information on the design, defects, operational and sea-state survivability requirements of the study vessel for the project. Pacific ESI, Sydney, are providing the software for the numerical wave tank, which is the Virtual Performance Solution software from ESI Group, France. Pacific ESI is providing numerical modelling expertise and the computational resources to do the analysis. UNSW will be providing efficient particle distribution generation techniques to be implemented in future analysis phases of the project.

The collaboration facilitated through the ARC grant presents an opportunity to bring a suite of emerging numerical and theoretical techniques from aerospace, civil and automotive industries together for the purpose of reducing risk in the maritime industry.

Bruce Cartwright

University of Adelaide

Dual Master's degrees with France to boost defence skills

Skilled engineers for the Australian and global defence industries — specifically in submarine and ship building — will be able to graduate from a new dual Master's degree in engineering to be offered in Australia and France.

The announcement, made on 2 May by the University of Adelaide and French education institution, ENSTA Bretagne, in the presence of the President of the French Republic, Emmanuel Macron, and the Australian Prime Minister, Malcolm Turnbull, is the latest in the University's growing commitment to defence skills, education and research.

The University's Vice-Chancellor and President, Prof. Peter Rathjen, and the Director of ENSTA Bretagne, Pascal Pinot, exchanged copies of a signed partnership agreement between the two institutions during a meeting in Sydney with President Macron and Prime Minister Turnbull. The event was part of President Macron's official visit to Australia.

"This new degree program is a perfect example of what can be achieved through international collaboration to co-create the future workforce," Prof. Rathjen says.

"Universities are unique institutions because they bring together innovation, human capital and global connectivity, for the benefit of society and the economy. That's exactly what we're seeing in this partnership with France."

The University of Adelaide is Australia's leading university in defence engagement with government and industry.

"Our new, dual master's program will feed directly into the defence engineering skills base available to South Australia, as the State prepares for $89 billion of defence spending on submarines and surface ships over the coming years," said Prof. Pascale Quester, Deputy Vice-Chancellor (Academic).

"The program will target technicians and engineers from Australia or internationally who are seeking to

upskill or transition from other industry sectors, such as manufacturing."

The new international master's program will see students — both experienced engineers and recent undergraduates — spend one semester in Brest, France, one semester in Adelaide, and a third semester in a jointly-supervised industry internship.

Students who complete the program will be awarded two Master's degrees: a Master of Marine Engineering from the University of Adelaide, and a Master of Science in Marine Engineering, Surface Ships and Submarines from ENSTA Bretagne.

Prof. Quester said that the new joint program with ENSTA Bretagne builds on over a decade of the University's successful Master of Marine Engineering program, delivered in partnership with Australian submarine and warship builder ASC.

"Today's announcement demonstrates the commitment of the University of Adelaide to co-creating with industry partners the workforce of the future. This joint program will shore up our reputation as a global leader in the delivery of courses on the design, construction and sustainment of surface ships and submarines," she says.

Teaching for the new program will begin at ENSTA Bretagne, France, in August 2018, and will continue at the University of Adelaide in February 2019.

ENSTA Bretagne is a French Multidisciplinary Graduate and Post-Graduate Engineering School and Research Institute, under tutelage of the French Defence Procurement Agency (DGA). ENSTA Bretagne aims to produce engineers capable of mastering the design of complex industrial systems in an international environment, required by civil industries and the DGA. ENSTA Bretagne is renowned for its specialised courses in maritime engineering, IT, mechanics and project management, such as naval architecture, robotics, autonomous underwater vehicles, hydrography, software and cyber-security, embedded systems and AI, signal processing, pyrotechnics, modeling and related areas.

Flinders University

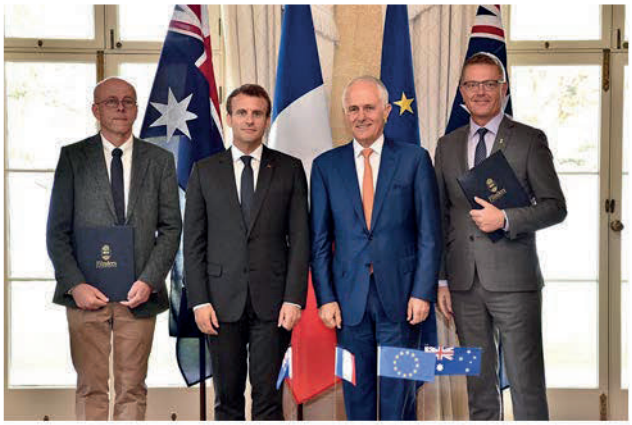
Agreements to Advance Defence Research

Australian-French research collaboration on marine technologies has taken a further step forward with two significant announcements involving collaborations with Centrale Nantes, and with Defence company Thales and ENSTA Bretagne.

The announcements took place in Sydney at a ceremony attended by His Excellency Emmanuel Macron, President of the French Republic, and The Honourable Malcolm Turnbull MP, Prime Minister of Australia, demonstrating close scientific and research collaboration between Australia and France.

Centrale Nantes Agreement

Researchers from the Flinders Centre for NanoScale Science and Technology and Centre for Maritime Engineering, Control and Imaging will join Centrale Nantes' world-leading researchers on projects focused on two key themes of additive manufacturing, naval hydrodynamics and simulator development.



From left: Director of Centrale Nantes, Prof. Arnaud Poitou, President of France Emmanuel Macron; Prime Minister of Australia Malcolm Turnbull; President and Vice-Chancellor Flinders University, Prof. Colin Stirling.
(Photo courtesy Flinders University)

The partnership will also provide opportunities for French and Australian students to undertake exchange placements and internships.

This collaboration will initially focus on two project areas.

The first involves marine propellers, and will investigate the use of nano-composite technologies for manufacturing marine propellers to increase blade strength and reduce noise and corrosion, as well as reducing manufacturing costs associated with existing metal fabrication technologies. The project will develop experimental models to explore the feasibility of manufacturing "smart" composites with embedded sensors to monitor performance and ensure structural integrity.

The second relates to 3D printing of metal-polymer composite materials. The field of additive manufacturing is still in its early days and there are still many challenges to research ahead of its widespread adoption.

The newly-formed Centrale Nantes-Flinders University research team will work together to scope and understand the challenges in 3D printing of metallic and composite materials, with the work of the investigative team researchers being at the forefront of additive manufacturing development.

Prof. Arnaud Poitou, Director of Centrale Nantes, says the collaboration promises to advance global understanding in the field of marine technology.

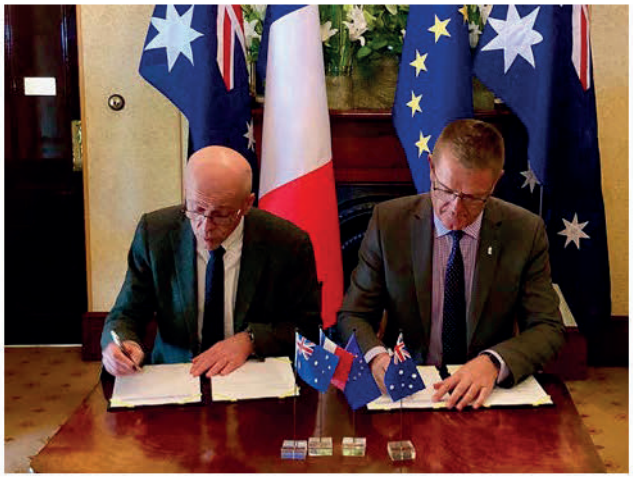
"Centrale Nantes is pleased to welcome Flinders University to join our world-leading researchers in Nantes. The research teams at Flinders will further enhance our efforts in this area to assist in developing the maritime technologies of the future," Prof. Poitou said.

Vice-Chancellor, Prof. Colin Stirling, thanked Centrale Nantes for the opportunity to collaborate with their research teams.

"Flinders University welcomes the opportunity to share its defence research expertise on the international stage, and grow its relationship with Centrale Nantes to make a positive difference to an accelerating global industry," Prof. Stirling said.

Thales-ENSTA Bretagne Agreement

Deeper collaboration between Australia and France in



Prof. Poitou and Prof. Stirling signing the Central Nantes-Flinders research agreement
(Photo courtesy Flinders University)

advanced sonar and naval robotics technology will flow from a Memorandum of Understanding (MOU) between Flinders, ENSTA Bretagne — a leading Graduate and Post-Graduate Engineering School and Research Institute in Brest, France, and Thales.

Thales Australia CEO, Chris Jenkins, said that the agreement will deepen and extend well-established research linkages between Australia and France in order to contribute to the future submarine program in Australia.

He said that President Macron's official visit was an opportunity to highlight the strength of the strategic relationship between Thales and France, a relationship underpinned by linkages like the research MOU signed today and the 2017 Intergovernmental Agreement.

"This is all about attracting the best and brightest in both Australia and France to work on the challenges of the future submarine program, ensuring that Australia gets the best capability.

"The MOU provides a long-term framework for collaboration in naval robotics applicable to both submarine and surface-ship sonars, including opportunities to share testing facilities, operate exchange programs and facilitate joint research projects.

"It builds on an already-strong relationship between Thales and Flinders University in Australia as well as between ENSTA Bretagne and Thales in Brest, France.

Alexis Morel, Vice-President Underwater Systems at Thales, said that discussions with Flinders and ENSTA Bretagne had already identified two topics for research collaboration — one to design a demonstrator for the automatic connection of electro-optical links in a maritime environment and, secondly, for the development of USV test vehicles suitable to test autonomy algorithms on robotic swarms at sea.

"This collaboration will build Australian capability, provide internships for both undergraduate and postgraduate Flinders University students in France and contribute to design solutions for the future submarine program" he said.

Vice-Chancellor, Prof. Colin Stirling, said that Flinders was delighted to be partnering with Thales teams based in Australia and in France.

"This MoU will open up great opportunities for closer collaboration with Thales research laboratories and follows the recent announcement that Flinders University will be one of Thales Australia's academic partners in the new Defence Cooperative Research Centre (CRC) for Trusted Autonomous Systems."

ENSTA Bretagne Director, Pascal Pinot, stressed the fact that the MoU was a necessary base to start new research projects between Flinders University, Thales and ENSTA Bretagne which would, in turn, reinforce the cooperation between the Defence ministries of the two countries.

"The MoU was built in order to lead to tangible research work between us in the short term, particularly in the field of underwater robotics," he said. "It builds on the strength of all three participants in the framework of the increasing bilateral defence cooperation".

UNSW Sydney

Student–Staff Get-together

The naval architecture students and staff held a get-together on Tuesday 20 March. This was to enable the students in early years and on study abroad to meet and get to know the later-year students and the staff on a social level, and to discuss the course and matters of mutual interest. Pizza, chicken, beers and soft-drink were provided and, after a slow start, conversation was flowing pretty freely an hour later! This year we have three students in the third year and about nine in fourth year and, amazingly, eighteen naval architecture students from NTNU (Norwegian University of Science and Technology) in Trondheim, Norway, or more than half of those attending the get-together! A broad mix, and some wide-ranging discussions ensued.

Thesis Projects

Among the interesting undergraduate thesis projects recently completed or commenced are the following:

Development and Optimisation of a Soft Wing Sail

The performance of soft wing sails can be significantly improved through design and optimisation. Stefano Ferrighi investigated the development of a soft wing sail rig which can be used with the same ease as current sail designs while offering an improvement in performance.

The performance of a number of different sailing rigs was examined through computational fluid dynamic simulations. The results showed that an airfoil section extending to 50% of the sail chord can lead to gains in speed of up to 7 kn in the upwind sailing condition. A prototype was created and tested on the water on an International moth, and this sail showed competitive upwind speed with great potential for future iterations. The sail was considerably harder to trim (or adjust to the varying wind conditions) but made a very promising start.

Analysis of the Naples Warped Hard Chine Hull Systematic Series Data

A recent paper published the results of tests on a systematic series of warped hard-chine hullforms known as the Naples Systematic Series. The authors came up with equations for determining the resistance and trim for each of the models in the series at specific values of the length/beam ratio. While the authors did not give any method for interpolating for length/beam ratio between the models, they did publish the

UNSW naval architecture students and staff at the annual get-together
(Image courtesy David Lyons)

complete results for all models tested in the series.

Yun Wang has programmed the resistance and trim equations for all the models, and come up with a method of interpolation which gives sensible results. The investigation has now moved on to see whether an equation can be found to fit the complete results for all models tested in the series to avoid having to interpolate for length /beam ratio. This is being done, firstly with regression analysis on polynomials with varying numbers of terms, and will then try using artificial neural networks.

Phil Helmore

UNSW Canberra

UNSW Defence Research Institute

UNSW Canberra has launched the new UNSW Defence Research Institute to deliver world-class defence research to enhance Australia's security.

The UNSW Defence Research Institute draws on the expertise of researchers from the University of New South Wales in Sydney and Canberra to provide Defence with solutions to real-life issues.

Headquartered at UNSW Canberra, the institute was officially launched on 16 February by UNSW Vice-Chancellor and President, Prof. Ian Jacobs, ahead of celebrations at Parliament House, marking the 50th anniversary of educating Australia's future military leaders.

"World-class defence starts with world-class research," Prof. Jacobs said.

"UNSW Canberra has 50 years of experience partnering with Defence and a 50-year history of excelling in research.

"The UNSW Defence Research Institute will combine our strengths and lead the way for the next 50 years and beyond."

Prof. Jacobs said that the institute's knowledge will be shared with communities across academia, government and industry, as well as global policy makers.

UNSW excels in areas such as cyber security, space, systems engineering, artificial intelligence, logistics, hypersonics, defence-related public-sector management and conflict studies," he said.

INDUSTRY NEWS

Australia-France Defence Industry Symposium

On 2 May the Prime Minister Malcolm Turnbull and President Emmanuel Macron of France announced the establishment of an annual Australia-France Defence Industry Symposium.

The Minister for Defence Industry, the Hon. Christopher Pyne MP, will co-chair the symposium with his French counterpart, Minister Florence Parly, and said that he was looking forward to working with Minister Parly to progress this important initiative.

"The Australia-France Defence Industry Symposium will focus on identifying further opportunities to deepen our defence industry and capability cooperation for the benefit of both nations."

"Australian and French businesses already have a strong track record of partnering to develop and deliver innovative capabilities," Minister Pyne said.

"In February, I had the pleasure of congratulating Australian business Thomas Global and France's Safran Group on establishing a partnership to manufacture and maintain defence equipment in Australia.

Minister Pyne joined the Prime Minister and Minister Payne in thanking President Macron and the French Government for its ongoing support for Australia's $50 billion future submarine program.

"Through this program, France's Naval Group will partner with Australian industry to deliver a fleet of 12 regionally-superior submarines, creating an annual average of around 2800 jobs," Minister Pyne said.

The symposium was announced as part of the Australia-France Initiative (AFiniti) signed by Prime Minister Turnbull and President Macron.

AFiniti will strengthen collaboration on emerging priorities and usher in a new era of Australia-France cooperation.

Austal Acquires Electrawatch

On 2 May Austal announced that it has reached an agreement to buy ElectraWatch Inc., a United States-based aluminium non-destructive testing technology company.

Austal has agreed to acquire 100% of ElectraWatch Inc. for an all-cash consideration of $US6.75 million, with no net debt.

ElectraWatch has developed and deployed a unique portable system for the non-destructive testing of aluminium used in demanding environments, in this case predominantly for aluminium ships.

The primary customer for the technology to date has been the United States Navy, both directly and through other major prime contractors and the system forms part of a monitoring environment for a variety of vessels.

Austal is the world's largest aluminium shipbuilder with both defence and commercial operations. ElectraWatch will make a valuable contribution to the aluminium shipbuilding knowledge and experience base of the company and will grow the support and services business which is a key focus both in the USA and more broadly. ElectraWatch will continue to operate under its own brand inside the service and support business of Austal USA.

Commenting on the acquisition, Austal's Chief Executive Officer, David Singleton said: "The acquisition reflects Austal's commitment to having the most advanced technology utilised in every element of our shipbuilding enterprise. Combining ElectraWatch's patented technology with Austal's advanced ship design, manufacturing and sustainment expertise will reinforce the company's position as the industry leader in advanced aluminium shipbuilding."

"In particular, this acquisition will effectively support and increase our range of services for the shipbuilding and sustainment requirements of our key customer, the United States Navy" Mr Singleton said.

Ed Dudson Joins Incat Crowther

Incat Crowther is pleased to confirm Ed Dudson as Managing Director of its UK business and as a board member contributing to overall business direction.

With more than twenty-five years of experience in the design and construction of high-performance vessels including fast ferries, wind-farm vessels, offshore vessels and patrol

boats, Ed's capability, reputation and integrity are a natural addition to the Incat Crowther brand.

Incat Crowther has design offices in Australia, USA and the UK, each capable of responding to clients' needs within the context of the regional market. With a large portfolio of vessels delivered and market-leading technology, Incat Crowther is able to offer proven designs in tight timescales. Incat Crowther now has more than 500 vessels in operation globally.

"Incat Crowther's mission is to deliver the best technical and commercial solutions and service to our shipyard and operating partners. Ed's decision to join our firm is significant to this goal, as only the best people working together can serve our partners in this way" said Brett Crowther, CEO of the group.

"I have a great deal to contribute to this exciting and vibrant industry, and Incat Crowther is the best in the business. I look forward to growing new and existing relationships in the market I am so passionate about" said Ed Dudson.

Ed commenced his role at Incat Crowther in early 2018.

Australian Steel for Type 26 Variant

On 18 April BAE Systems Australia announced that it will partner separately with each of BlueScope and Liberty OneSteel for the supply of more than 48 000 t of Australian steel, should the company be selected to build nine future frigates as part of the Commonwealth Government's SEA 5000 program.

BAE Systems is offering its Global Combat Ship-Australia for SEA 5000, a variant of the Type 26 anti-submarine frigate which is currently under construction in the UK.

Liberty OneSteel will provide structural steel sections for the future frigates from its Whyalla facility, as well as products for 4000 t of structural steel for shipbuilding infrastructure, including cradles and other fixtures.

Liberty OneSteel will also have the opportunity to provide value-added processing, fabrication and welding in the Whyalla supply chain prior to delivery. BlueScope will potentially provide plate steel which will be manufactured at its facility in Port Kembla, NSW.

BAE Systems Australia Chief Executive, Gabby Costigan, said "For SEA 5000 we are committed to building the future frigates in Australia using Australian suppliers at every opportunity. This includes maximising the use of Australian steel on the program. We are proud to support the Australian steel industry throughout our business and will grow that support if we are successful on SEA 5000."

Liberty OneSteel Executive Chairman, Sanjeev Gupta, said that his company was "honoured to be involved with such an exciting project" should BAE Systems be awarded the contract.

"It's vital for the future of our industry that government projects adopt an Australian-made focus, so we commend BAE Systems for prioritising local products and services and trust that this focus will assist in its bid," Mr Gupta said.

BlueScope's General Manager of Sales & Marketing, Bernie Landy, said "BlueScope applauds BAE Systems in its commitment to maximise the use of Australian steel should it be selected by the Australian Government to build the future frigates."

"This is not only a significant opportunity for BlueScope, but also for the broader Australian manufacturing industry. We are thrilled about the prospect of a large-scale local shipbuilding industry in Australia and are fully committed to assisting in its development," Mr. Landy said.

KBR wins Future Submarine Construction Yard Concept Design Contract

On 19 March 2018 it was announced that Naval Group Australia has partnered with KBR to support the design of the future submarine construction yard, part of the Osborne naval shipbuilding precinct in Adelaide.

The Minister for Defence Industry, the Hon. Christopher Pyne MP, said that the future submarine construction yard would sit alongside the surface shipyard, where the Royal Australian Navy's future frigates will be built.

"KBR has extensive experience in this field and it's great that they have partnered with Naval Group Australia to complete the concept design for the state-of-the-art construction yard," Minister Pyne said.

"I would like to congratulate KBR on this contract, worth around $7 million, which will employ 100 of their South Australian staff on the concept design."

The design of the future submarine construction yard will continue throughout 2018.

Navantia Australia Opens Naval Design and Engineering Centre in Melbourne

On 24 April Navantia Australia formally opened its Naval Design and Engineering Centre in Melbourne's Docklands. Victorian Defence Industry Advocate, Greg Combet AM, together with Navantia's global chairman Esteban Vilasanchez and Navantia Australia Chairman Warren King opened the facility, which will complement Navantia Australia's Adelaide Operations and Design Centre.

"The continuous naval shipbuilding program is a national endeavour," Mr King said. "Navantia Australia is continuing to grow and develop our sovereign capability, which means drawing on the best engineers and naval architects from around the country. The Melbourne Naval Design and Engineering Centre will work in partnership with our Operations and Design Centre in Adelaide to ensure the success of Australia's sovereign naval shipbuilding capability and our development into a nation with a competitive export capability."

The Design and Engineering Centre, led by Operations Manager Jamie Gibbs, is focussed on developing Australia's future frigate capability and supporting the Hobart-class destroyers. Following the designation of Navantia Australia as class manager of the Hobart Class in February 2018, Navantia Australia is now responsible for maintenance of the design configuration of the three Hobart-class destroyers, in addition to having full authority for the design of the F-5000, Navantia's proposed future frigate.

"The local capability which Navantia Australia has developed is significant," said Mr Vilasanchez. "Navantia is

immensely proud of the capability we are delivering to the Royal Australian Navy in the Hobart Class. With the formal transfer of the Hobart-class design authority, Navantia Australia is in an excellent position to lead the development of a sovereign naval capability. This new office will be instrumental in delivering top-class design and engineering services for Australia."

Navantia Australia has facilities in Adelaide, Sydney, Canberra and Melbourne, and will open a Western Australian facility later this year. For over a decade, the company has worked with over 200 partners from around Australia to deliver world-leading naval capability to the Royal Australian Navy, including the Canberra-class amphibious vessels and landing craft, the Hobart-class destroyers, and the Supply-class replenishment vessels currently under construction in Spain.

ASC Shipbuilding wins Safety Award

The Royal Institution of Naval Architects has awarded ASC Shipbuilding the Lloyd's Register Maritime Safety Award for 2017, recognising the Portable Fire Control System as a significant technological contribution to improving maritime safety.

ASC Shipbuilding Acting Chief Executive Officer, Jim Cuthill, said that the award recognised the safety and learning culture of the company, which employs more than 1000 of Australia's leading shipbuilders and is responsible for delivering Australia's new air-warfare destroyers. "ASC Shipbuilding may be a young company but we are showing that we have cutting-edge capability and a highly-productive workforce," Mr Cuthill said.

"This prestigious international award demonstrates our commitment to practical safety and innovation — qualities which our workforce will bring to future shipbuilding roles, starting with the Offshore Patrol Vessel program later this year. ASC Shipbuilding is also strongly placed to become the sovereign Australian shipbuilder of the future frigates, starting in 2020, subcontracting to the prime contractor/designer of the Government's choice."

The Portable Fire Control System was designed and manufactured by ASC Shipbuilding personnel and is partly credited with a track record of eight years in which there have been no major fire incidents at the ASC Shipbuilding facility in Osborne, South Australia. The system is a network of dozens of multi-function panels distributed throughout a major vessel under construction which are used to raise the alarm and provide information of any fires or fire risks detected. The award was accepted at the annual dinner of the Royal Institution of Naval Architects, held in London on 12 April. The Portable Fire Control System was developed jointly by ASC Shipbuilding's Electrical and Controls Team and Emergency Response Group.

Thales Australia Minehunter Program Honoured

The Thales Australia Minehunter In-service Support Program has been recognised for Excellence in Innovation by the Asset Management Council of Australia.

Thales' Minehunter In-service Support Contract (MHC ISSC) team located in Newcastle, Waverton and Garden Island, NSW, has received the award for Excellence in Innovation by the Asset Management Council of Australia, at the annual AMPEAK conference held in April 2018. The Innovation award was highly contested by a number of industries including civil infrastructure, oil and gas, mining and Defence.

Through the MHC ISSC, Thales provides asset management services including planning, engineering, logistics, configuration, maintenance and material management support services to the Capability Acquisition and Sustainment Group (CASG) in support of the Royal Australian Navy's Huon-class minehunters.

Thales' MHC ISSC program successfully achieved accreditation to the ISO 55001:2014 Asset Management Standard in June 2017. Thales applied an innovative approach to achieving the certification which ultimately provides a framework to assure comprehensive coverage as it delivers holistic through-life asset-management requirements from cradle to grave.

BMT Australia Opens Adelaide Office

BMT Australia has opened its doors in Adelaide. On 14 May the Minister for Defence Industry, the Hon. Christopher Pyne MP, formally opened the company's Adelaide office.

BMT Australia, a subsidiary of BMT Group, is a maritime engineering, science and technology consultancy which has key roles in many major naval defence projects.

Minister Pyne said that it is great to have a company such as BMT setting up shop in Adelaide.

"It is fantastic to see BMT Australia expanding its footprint after operating in Australia since 2005," Minister Pyne said.

"BMT Australia is yet another organisation expanding their offices and workforce because of the Government's huge investment in the country's defence capability."

"The new Adelaide premises will house a submarine engineering capability and members of the senior leadership team including the Managing Director and Chief Financial Officer."

"By July the company is set to double their staff in Adelaide to almost 20."

"This proves yet again that South Australia is one of the real hubs of naval shipbuilding in Australia; in fact, BMT has indicated that they are creating more jobs within their company than ever before."

The company has been supporting major defence projects for years, including the Air Warfare Destroyers and Landing Helicopter Docks.

Opening of the Australian Defence Export Office

On 23 April 2018 the Minister for Defence Industry, the Hon. Christopher Pyne MP, opened the Australian Defence Export Office in Canberra.

Minister Pyne said that the establishment of the Australian Defence Export Office was one of the key initiatives of the Defence Export Strategy released on 29 January 2018.

"The Defence Export Strategy sets out a plan to boost Australian industry, increase investment, and create more jobs for Australian businesses," Minister Pyne said.

"The Australian Defence Export Office will provide a focal point for whole-of-government delivery of the systematic approach and initiatives set out in the Strategy."

Minister Pyne said that establishing the Australian Defence Export Office was a critical step in achieving the export success which we need to support and develop the Australian defence industry of tomorrow.

"We have a clear strategic vision for a sovereign Australian defence industry which underpins our defence capability. A defence industry which is sustainable and internationally competitive is crucial to this vision.

"I look forward to seeing the Australian defence industry achieving greater export success, supported by the Australian Defence Export Office," Minister Pyne said.

The Australian Defence Export Office will deliver a range of initiatives to assist and support Australian defence industry, including producing market intelligence, partnering with industry in multi-year campaigns, and leading the Australian Military Sales and Team Defence Australia initiatives.

For more information, contact the Australian Defence Export Office at Aust.DEO@defence.gov.au.

Qinetiq and CSIRO to Capture CO_2

The Royal Australian Navy's future submarines could benefit from new carbon dioxide capturing technology which would allow the submarines to stay submerged for longer periods of time.

The Australian national science agency CSIRO is teaming up with engineering services company QinetiQ on a project which aims to provide better conditions for sailors through the use of advanced crystal technology called Metal-Organic Frameworks (MOFs).

As a submarine is an enclosed space, CO_2 expelled by the crew's breathing and other chemical processes builds up and can eventually become toxic. Carbon dioxide scrubbers avoid that, by removing CO_2 from a submarine's atmosphere and storing it for later release.

Current CO_2 scrubbers take up a large amount of the limited space, weight and power available in submarines. They can also generate corrosive by-products, which have both health and sustainment implications in the close confines of submarines.

A MOFs-based system would use a smaller amount of space, place less demands on a submarine's systems and would not rely on damaging gases.

It could also be incorporated into existing submarines, such as Australia's current Collins class, to extend their operational life and capabilities, Qinetiq said.

If successful, this new technology could form part of the Australian government's Future Submarines Program involving the design and construction in Adelaide of 12 submarines with a range in excess of 16 000 n miles and capable of operating independently for up to 80 days.

"Together, we'll be testing whether advanced materials known as MOFs can allow submarines to remain submerged longer. MOFs have the largest internal surface area of any known substance, which can be optimised to capture gases such as carbon dioxide," CSIRO project leader, A/Prof. Matthew Hill said.

"The more CO_2 which MOFs can capture and store, the longer a submarine can potentially remain underwater, undetected."

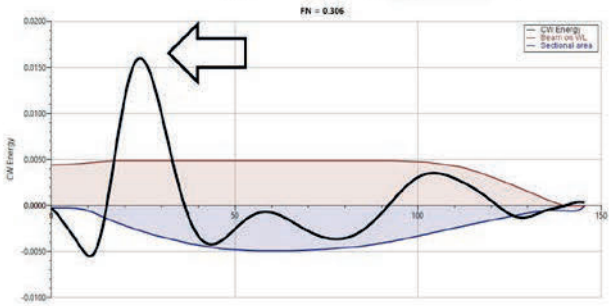
"If proven, MOFs could give Australian submarines an edge, a performance advantage which lets them dive longer while placing less demand on precious space and weight, as well as critical systems such as power," QinetiQ Australia managing director, Greg Barsby, added.

New Features in Navcad 2018

For hydrodynamic design and analysis of ships and other marine vehicles, design engineers turn to NavCad for the prediction of attainable speed and range, power demand, fuel consumption, even noise. NavCad provides the critical feedback needed in early-stage design.

New features in Navcad 2018 include:

- New software-based security options (omitting the need for a USB dongle).
- Substantial time savings running calculations.
- Scale correction for improvements to full-scale MAU propeller performance prediction.
- Calculation of mass fuel rate.
- Improved hull-propulsor prediction for submarines and SWATH vessels.
- "Longitudinal Wave Source" plot for the "Advanced Distributed Volume Method" (ADVM), which shows longitudinal shape influence on wave-making resistance [Premium]
- Support for dual-fuel (MGO, MDO, HFO, LNG) [Premium]
- Prediction of CO_2 greenhouse gas [Premium]



NavCad Longitudinal Wave Source
(Image courtesy HydroComp)

The new NavCad Premium Edition features for dual fuel, calculation of CO_2 production, and the longitudinal wave source plots are very significant, especially for LNG vessels.

NavCad allows the user to achieve simulation of the whole hull-propulsor-drive-engine system now in seconds, rather than hours.

World's first Auto-docking Installation

Wärtsilä has successfully carried out testing of its innovative auto-docking technology. The tests were carried out with *Folgefonn*, an 83 m ferry owned by leading Norwegian operator Norled. The vessel has hybrid propulsion and is already fitted with a Wärtsilä wireless charging system. The installation of auto-docking on a ferry is a world first.

The auto-docking tests took place commencing in January of this year and were completed in April with actual

harbour docking trials. At no time during the tests did the captain need to take manual control.

The procedure means that the system is activated some 2000 m from the berth and the vessel continues at normal transit speed. The system then performs a gradual slowing of speed, and activates the line-up and docking manoeuvre fully automatically until the ship is secured at the berth. When the ship is ready to sail again, the system may be used for the departure procedure in an identical but reverse manner.

Full manoeuvring of the vessel, including the steering and propulsion, is automatically controlled by the software. However, manual intervention and control is possible at any time. The automatic function allows the ship's officers to focus on situational awareness outside the wheelhouse, thereby improving the safety and reliability of the operations.

Wärtsilä's auto-docking technology delivers notable benefits to operators. These include improved safety since there is less likelihood of human error, less wear and tear since the thrusters are efficiently utilised, and greater efficiency in docking which allows more time at berth.

Norled has made *Folgefonn* available to Wärtsilä for further development of a number of Wärtsilä Smart Marine products and systems. Among the Wärtsilä technologies already installed and tested are its energy optimisation system, the hybrid propulsion system, wireless inductive battery charging, and energy storage. The ferry can can now be operated with automatic wireless charging, automatic vacuum mooring and automated docking.

The innovative Wärtsilä auto-docking technology tests were carried out with the ferry *Folgefonn* owned by Norled (Photo courtesy Wärtsilä)

Wärtsilä's autodocking project is supported by the Norwegian state-owned Innovasjon Norge (Innovation Norway).

In 2017, the same Wärtsilä team successfully tested remote controlling of a ship sailing in the North Sea from its San Diego, California location. Developing intelligent vessels is central to Wärtsilä's smart marine ecosystem vision.

Saab Australia wins Collins-class Submarine Contract

The Minister for Defence Industry, the Hon. Christopher Pyne MP, has congratulated Saab on their recent contract with ASC to supply an updated Integrated Ship Control Management and Monitoring System (ISCMMS) for four Royal Australian Navy Collins-class submarines.

"I congratulate Saab on their technological advancement and also thank ASC for their work integrating this upgrade into HMAS *Collins*," Minister Pyne said.

"This $24.2 million project will support 50 jobs, the majority of which are in Adelaide."

Saab's ISCMMS enables the Collins-class submarines to manoeuvre and fully integrates the management of propulsion, trim, power generation and ship services.

HMAS *Waller* will be upgraded in 2018, and the system will be integrated into the remaining submarines in 2019 as they undergo their routine maintenance cycles.

SAAB Signs OPV Subcontract

Saab Australia had been chosen by Lürssen to provide the Situational Awareness System for the Royal Australian Navy's 12 new Offshore Patrol Vessels.

The OPVs will also be fitted with Saab's EOS 500, a lightweight electro-optical fire-control director used for observation, target identification and fire control.

LNG-fuelled Harbour Tug to be Designed and Equipped by Wärtsilä

Wärtsilä will design and equip one of PSA Marine's newest harbour tugs. Operating on clean-burning LNG fuel and incorporating fuel efficiency features, the harbour tug, which will be built by PaxOcean Shipyard, will be aligned with the maritime industry's increasing emphasis on environmental impact. The order with Wärtsilä, booked in March 2018, to build its first LNG-fuelled harbour tug is also in line with PSA Marine's efforts to reduce its carbon footprint as a leading service provider of marine services.

The 28 m long, 50 t bollard pull harbour tug will operate with two Wärtsilä 20DF dual-fuel engines running primarily on LNG fuel. Wärtsilä will also supply its LNGPac fuel storage-and supply-system as well as steerable thrusters and the Wärtsilä ProTouch control system. The equipment will be delivered to the yard at the end of 2018 and the harbour tug is slated to commence operations in the port of Singapore around mid-2019.

The Wärtsilä designed and equipped LNG fuelled harbour tug (Image courtesy Wärtsilä)

Construction Standards: Vessel Modifications and Survey

Vessel grandfathering means that some older vessels can continue to meet the standards which applied to them before 1 July 2013, unless certain changes are made to the vessel or its operation. Some of the most-common questions which AMSA receives from industry are:

- When does a vessel lose its grandfathering status?
- What kinds of change result in a grandfathered vessel becoming a transitional or new vessel where newer standards apply?
- What are the consequences of becoming a new or transitional vessel, and what standards will apply?

On 1 January 2018 a revised version of Marine Order 503 commenced, introducing a new schedule (Schedule 1). Schedule 1 lists the types of changes and modifications which AMSA considers to be triggers which result in a requirement for a vessel to be re-assessed against new or transitional vessel standards. Schedule 1 is located in the last few pages of MO503, which is available online at https://www.legislation.gov.au/Details/F2017L01579

The changes to MO503 significantly improve the transition process for vessel owners by providing a more-gradual and clear pathway from grandfathered standards to the contemporary National Standard for Commercial Vessels (NSCV). However, a vessel which makes any Schedule 1 changes is currently required to undergo a full initial survey.

This process requires a surveyor to re-verify the whole vessel against approved plans and in accordance with the applicable standards, as if the vessel were entering survey for the first time.

AMSA recognises that this full re-verification process is not appropriate for all the changes listed in Schedule 1 and is now proposing to further update MO503. Our intention with these changes is to improve the transition process and reduce the regulatory burden on vessel owners. The proposed updates provide a more-targeted approach to survey without compromising on safety.

The proposed updates can be broadly described as dividing the survey depth requirements, for vessels which make Schedule 1 changes, into three distinct categories:

1. *Changes which require a full initial survey re-verification:*

- upgrade or addition of a service category;
- relocation of a vessel outside a current geographical restriction;
- increase of propulsion power which invalidates the original structural or stability approval; or
- changes to the vessel's structure or watertight integrity including hull alteration, change in vessel dimensions, alterations to passageways, fitting of or alteration of watertight bulkheads or decks.

2. *Changes which require a renewal survey, plus initial survey for the areas of the vessel affected by the change:*

- commencement of dangerous goods carriage;
- commencement of overnight operations with accommodation;
- an increase in persons or passengers on the vessel's Certificate of Survey;
- addition of new berths;
- increase in the windage profile; or
- removing, repositioning or installing fixed ballast, lifting gear, net reels, cranes, trawl apparatus, refrigeration equipment, tanks or towing points.

3. Changes which require only a renewal survey:

- variations to lightship or longitudinal centre of gravity; or
- changes to a fixed fire system, stern gear, gas system or electrical power and generators.

Remember, if considering any modification or change to a domestic commercial vessel, then it is essential to refer to MO503 to determine:

- whether the vessel has triggered a Schedule 1 change, and
- what standards apply as a result of the change and, if the proposed MO503 updates are made, what survey requirements apply.

It is important to note that all vessels are required to comply with the applicable standards listed in MO503 when they make changes. The further streamlining which AMSA is now considering relates to the depth of survey which a vessel is required to undergo when they trigger.

AMSA is currently consulting on these proposed updates to Marine Order 503. The planned commencement date for the changes is 1 July 2018 and consultation will be closed on 2 May. To review the guidance material and make submission, visit the AMSA website:

https://www.amsa.gov.au/news-community/consultations/survey-regime-consultation

Rob Maher
Principal Naval Architect
AMSA Vessel Safety Unit

THE INTERNET

Webcasts by the Victorian Section

The Victorian Section has recently purchased a video camera and commenced recording their technical presentations for webcasting for the Continuing Professional Development of members far and wide.

The two presentations which have been recorded so far are

- Rob Gehling, Royal Institution of Naval Architects, *Some Principles For Updating IMO's High Speed Craft Code*, presented on 14 March 2018 and now available on the RINA YouTube channel at https://youtu.be/0MMfMoDQBl0.
- Sean Langman, Managing Director, and Belinda Tayler, General Manager Defence and Commercial Noakes Group, *A New Lease of Life for Sydney's Iconic Floating Dock*, presented on 19 April 2018 and now available on the RINA YouTube channel at https://youtu.be/0MMfMoDQBl0.

Stand by for further instalments!

Phil Helmore

MEMBERSHIP

Australian Division Council

The Council of the Australian Division of RINA met on the evening of Tuesday 13 March 2018 by teleconference under the chairmanship of the President, Prof. Martin Renilson, in Launceston.

The meeting had a full agenda and some of the more significant matters raised or discussed were:

Industry Mailing List

Council members were requested to provide appropriate information improving the draft contact list.

Representatives on External Committees

Council endorsed the appointment of Mike Seward to represent the Division on Standards Australia's committee reviewing AS3962 *Guidelines for Design of Marinas*.

Financial Report

Council approved the audited financial report to be considered by the AGM the following day.

Next Meeting of Council

The next meeting of Council will be held on Wednesday 13 June 2018.

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.

Annual General Meeting

The Division's Annual General Meeting was held in Melbourne on Wednesday 14 March 2018 with the following outcomes:

- The President's report, published in the February edition of *The ANA*, was accepted.
- The meeting approved the audited Financial Report for 2017.
- New Council members nominated by Sections for the coming two years are Ian Laverock (ACT), Adrian Broadbent (NSW) and Cameron Whitten (Qld) replacing Tom Dearling, Sue-Ellen Jahshan and Mark Devereaux respectively. (Subsequent to the meeting, SA-NT Section nominated Peter Dandy).
- The circulated amendments to the Division's By-Laws were adopted. (The amended By-Laws have now entered force following endorsement by the Institution's Council on 11 April).

Rob Gehling
Secretary

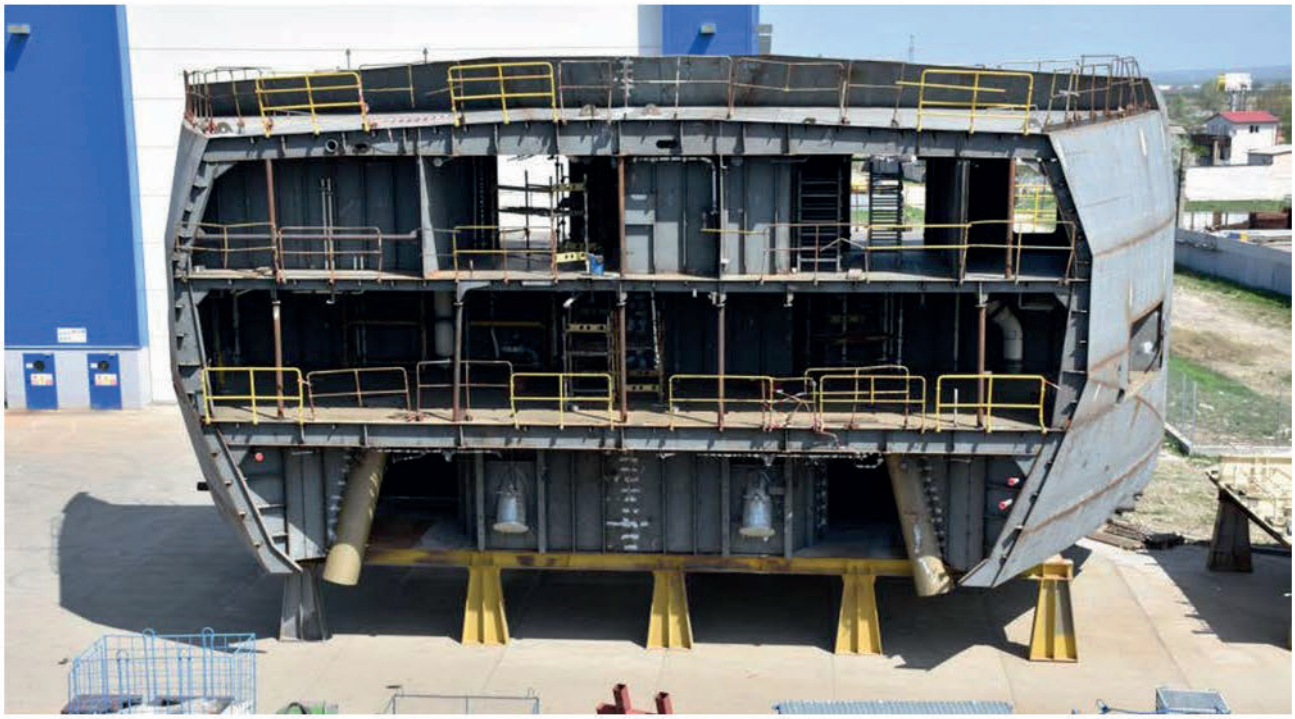
Changed contact Details?

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

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

RINA London		hq@rina.org.uk
Australian Div.		austdiv@rina.org.uk
Section	ACT	rinaact@gmail.com
	NSW	rinansw@gmail.com
	Qld	hamish@oceandesign.com.au
	SA/NT	peter.dandy@asc.com.au
	Tas	brian.winship@utas.edu.au
	Vic	owen.tregenza@dst.defence.gov.au
	WA	wa@rina.org.uk

Phil Helmore



A 300 t module for Australia's new Antarctic icebreaker RSV *Nuyina* at Damen's shipyard in Romania in early May. The ship is rapidly taking shape and more photos are available at www.antarctica.gov.au/news/2018
(Photo by Michael Jordaan, courtesy Australian Antarctic Division)

VALE

Wally Anderson

It is with sadness that *The ANA* records the passing of Charles Wallace Anderson on 23 December 2016 aged 91. He was born on 17 December 1925, grew up in Eastwood, and left school after the Intermediate Certificate in 1942. He could have chosen many trades, as he was a handyman, was meticulous and precise, could fix anything, make parts and bring back to life anything that was broken. However, he chose a different career path.

He commenced work at Mort's Dock in Balmain in the drawing office. After completing the three-year Shipwright trades course at Sydney Technical College, he went on to complete the Leaving Certificate and the first naval architecture course in Australia, the Naval Architecture Diploma, qualifying as an Associate of Sydney Technical College (ASTC). The foundations for his future communications with shipwrights and other trades had been laid.

While studying and working at Mort's dock, he also worked at the Eastwood Fire brigade from 1946 to 1952 as a volunteer with "belt, axe and spanner". Due to his proximity to the fire station, they connected a bell inside his house. He attended many fires, and missed many Christmas lunches. Each fire involved a different risk, from hazardous chemicals to exploding petrol drums. The fear of electrocution and toxic smoke from different timbers and plastics just added to his story telling. On one occasion he assisted in battling a major blaze in Botany where he was tasked to keep several diesel-driven pumps operating for an extended time to provide water from the nearby bay. In 2014 he went to the Eastwood Fire brigade's Centenary Celebrations and shared his stories of his time in the Fire Brigade. He was then featured in the local paper wearing the original brass helmet from back in the day.

Wal married Elsie in 1952 and they had one child, Lynnette, in 1954, the same year in which he completed his Naval Architectural Diploma. They lived in Epping with Elsie's parents, committing his life to looking after his parents-in-law for some 25 years until their passing. There was never a right time to leave the old family home. He knocked back travel and promotions to stay with the family.

Wal's work at Mort's was initially devoted entirely to naval construction as, at that time, they were building local defence vessels, corvettes, oil lighters and battle-practice targets. Later, time was spent on almost all phases of the building of many types of vessels, tugs, barges, dredges, lighters and cargo vessels. Later he was involved in drawing, checking and administrating structural detail drawings, stability, hydrostatic and launching calculations. He was involved in drawing the plans for and launching the vessels *Boonaroo* and *Baralga*, the last two vessels built and launched at Mort's Dock in 1954. These, together with repair work, conversions, rigging and estimating, afforded him extensive knowledge of his profession.

He was also responsible for the floating crane, *Titan* lifting an all-steel 90 ft long, 60 ft wide and 7ft deep, 150 ton (31.3 m long, 20 9 m wide and 2.13 m deep, 152.4 t) pontoon into the harbour at Balmain. The lift was the biggest ever at the dock at that time. The pontoon had been built over a 10 week period and, when launched, was towed to Port Kembla for the excavation of the inner harbour.

Wally Anderson
(Photo courtesy Lynnette Widman)

He was always one to ensure that things were correct and safe. Once when he was at Mort's Dock and involved in a heavy lift on a ship, he inspected the rig which looked satisfactory. Wal was suspicious though, and had the workers remove the bindings around some splices, to find heavy corrosion which could have failed under load. New slings were brought, and the lift went ahead, safely.

Mort's Dock closed in 1958, Mort's Dock and Engineering Company went into liquidation in 1959, and ceased trading completely in 1968. When the dock closed, Wal was approached by HMA Naval Dockyard, Garden Island, and he transferred there, commencing as an engineer in the Ship Drawing Office. By 1964 he was the Class 3 Naval Architect in charge of the Ship Drawing Office, overseeing up to six naval architects and 24 draftsmen. In 1966 he was the lead naval architect for the fitting of Ikara (the rocket-launched anti-submarine torpedoes) to HMAS *Perth*, the first guided-missile destroyer in the Royal Australian Navy. In 1968 he was the lead naval architect for the upgrade of the aircraft carrier HMAS *Melbourne* to take the larger, newer and more-capable A4 Skyhawk and S2 Tracker aircraft. This was one of the biggest jobs attempted at Garden Island at that time, modifying and upgrading an old aircraft carrier with new up-to-date and bigger equipment which had extra electrical power demands. In between, he was in charge of the Naval Architect Quality Section, which included tests and trials of hull and weapon systems.

From 1970 to 1988 Wal was the Naval Architect Dock (NAD), in charge of the Captain Cook graving dock and the floating dock, although for much of this time he was also relieving others at the Naval Architect Class 3 and 4 levels around the dockyard. As the NAD, he worked under pressure in an industrially-sensitive environment to meet docking work schedules to successfully dock ships. He always fully supported his staff. At one time when a caisson was being removed from its groove, it tilted and jammed. Wal remained on duty all night till the problem was found and fixed (a leak flooding an end compartment). He also used

his vast experience for new and unusual dockings, such as for the emergency docking of a very large merchant ship.

Wal was motivated, applying a very personal and diligent approach to work with a determination to achieve his goals. He was well liked and respected by everyone, from painters and dockers through to management, treating everyone as an equal, and always making time to listen. He was very practical and always helpful, and during his time at Garden Island Dockyard he was an excellent mentor to many naval architects, even though mentoring in those days was not formalised (as it is now).

He retired from Garden Island at age 65, and loved to talk about his experiences. He was thorough, always taking pride in a job well done. His attributes continued out of work. He was recognised as an unofficial foreman in the local area when the M2 motorway was subsequently being built near his home! He took great pleasure in overseeing the clearing of trees, how they were being cut and how they would land, to drainage problems which they would encounter. He did not hesitate to go to the top to rectify imminent problems that were never envisaged by the workers.

Wal is survived by his only daughter Lynnette, grandchildren Greg, Tyron and Karina, and great-grandchildren Charlotte, Zachary and Adelyn. He will be greatly missed and his knowledge, experience and ability have been lost with his passing.

Lynnette Widman
Hugh Hyland

Jeonghun (Scott) Ha

It is with sadness that *The ANA* records the passing of Jeonghun (Scott) Ha. He was an accomplished port engineer and a promising ship hydrodynamics researcher, nearing the end of his PhD studies when both he and his wife Mina were tragically killed in a car accident on 18 April 2018.

Jeonghun was born in Busan, South Korea, on 3 June 1979. On graduating from high school, he completed his military service and was then accepted into the Korea Maritime University. There he studied for a Bachelor of Engineering degree, majoring in civil engineering. As well as concrete and coastal engineering, the program included philosophy, Korean culture, English, Japanese, Chinese and German. He completed his undergraduate studies in 2004 with a grade point average of 95%.

The capital city of Seoul beckoned, and Jeonghun commenced working there in 2004. Thus began nine years as a port and harbour engineer in Seoul, working with Ere Engineering & Construction, Kyeong Seung Design & Consulting Incorporated, and Dae Young Engineering. Projects included breakwaters, quay walls, container terminals, dredging works, a yacht marina development, and a tidal power plant. The deep waters surrounding Korea presented many design challenges for port design, and Jeonghun also worked on overseas projects in Sri Lanka and Algeria.

Koreans are known for their strong work ethic, and this translated into long hours in the design offices. Jeonghun wanted a different future for himself and his wife, Mina, so they applied to come to Western Australia as Australian permanent residents. They were successful in their application and installed themselves in Perth in early 2014.

Jeonghun (Scott) Ha
(Photo courtesy Tim Gourlay)

Jeonghun commenced postgraduate studies at the Centre for Marine Science and Technology at Curtin University in late 2014 as a Masters candidate. In late 2015 he received an Australian Postgraduate Award to upgrade his candidacy to Doctor of Philosophy. His project title was *Measurement and Simulation of Ship Under-keel Clearance in Port Approach Channels*.

Jeonghun was able to combine strong mathematical and engineering skills with fine attention to detail, so that his numerical modelling and fieldwork were equally thorough and precise. He undertook detailed motion measurements on 30 separate ship transits entering and exiting the ports of Geraldton and Fremantle. His experience abseiling from helicopters during his Korean military service meant that swaying ship pilot ladders were of no concern. Following each set of measurements were months of painstaking analysis of the ship motions and environmental conditions, as well as comparisons with ship motion predictions.

Jeonghun authored the following research articles, all publicly available:

Validation of container ship squat modelling using full-scale trials at the Port of Fremantle, *Journal of Waterway, Port, Coastal and Ocean Engineering*.

Full-scale measurements and method validation of container ship wave-induced motions at the Port of Fremantle, *Journal of Waterway, Port, Coastal and Ocean Engineering*.

Bow and stern sinkage coefficients for cargo ships in shallow open water, *PIANC Bulletin*.

Measured ship motions in Port of Geraldton approach channel, *Proceedings MASHCON Conference*, Hamburg.

Sinkage and trim of modern container ships in shallow water, *Proceedings Coasts and Ports Conference*, Auckland.

Jeonghun was awarded third place in the PIANC International De Paepe–Willems Awards 2017 for his article *Bow and stern sinkage coefficients for cargo ships in shallow open water*. This article provides simple and accurate methods for ship squat prediction, for international port authorities and port users. His work on measured wave-induced motions of container ships is also receiving international attention, and will form an important set of benchmarking data for many years to come.

Jeonghun is greatly missed by his fellow students and all who knew him in the marine community.

Tim Gourlay

NAVAL ARCHITECTS ON THE MOVE

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

Jim Black has retired from Austal Ships after 26 years in various senior positions, and now does the occasional consulting job as long as it doesn't interfere with sailing!

Grant Brunsdon moved on from Chevron in 2016 and, after a short time with Fugro-TSM, has taken up the position of Thevenard Island Offshore Decommissioning Package Engineer back with Chevron in Perth.

Nichola Buchanan moved on from DMS Maritime in 2014 and has taken up the position of Naval Architect/AMSA Surveyor with John Butler Design in Sydney.

Dawei Cai continues as a naval architect with ASO Marine Consultants in Sydney.

Mitch Carmock has moved on from Capability Partners Asset Management and has taken up the position of Operations Manager with Boeing in Brisbane.

Kim Chamberlin moved on from BMT Design & Technology in 2010 and is consulting as Chamberlin Marine in Melbourne.

Anderson Chaplow has moved on within Lloyd's Register and has taken up the position of Senior Project Specialist in the Naval Liaison Office in Bristol, UK.

Yew Jinn Chieng continues as a naval architect with International Maritime Consultants in Fremantle.

Greg Chivers has moved on from crewing luxury yachts and has taken up the position of Director and UAV Pilot with Lunar Aerial Imaging in Stockport, UK.

Maghfar Chowdhury has retired from the Naval Technical Bureau in Sydney.

Martin Christensen has moved on within Australian Border Force and has taken up the position of Director Capability Development in Canberra.

Matthew Cleary continues as a senior lecturer in the School of Aerospace, Mechanical and Mechatronic Engineering at the University of Sydney.

Roger Duffield has moved on within the Department of Defence and has taken up the position of CoA Onsite Representative for the Department of Defence in Ferrol, Spain, for the SEA1654 Phase 3 Auxiliary Oiler Replacement Program, providing construction oversight/build assurance and assisting with communications between Navantia and the Commonwealth of Australia.

Liam Finegan has moved on and has taken up a position as a Quantitative Research Analyst with Denning Pryce in Sydney.

Keegan Graham-Parker, a recent graduate of the Australian Maritime College, has taken up a position as a Graduate Naval Architect with ASC in Henderson, WA.

LEUT Geordie Grant has moved on from HMAS *Canberra* and, after some time with the Amphibious and Afloat Support Group in Sydney, has headed to Afghanistan for six months as Staff Officer to Task Group Commander Afghanistan as part of Operation Highroad.

Adela Greenbaum has moved on from Roads and Maritime Services and has taken up a position as a Data Analyst with the Department of Human Services in Canberra.

Edward Hawkins has taken up a part-time position as a naval architect with One2three Naval Architects in Sydney while completing the requirements for his degree.

Daal Jaffers has moved on from Nautilus Minerals and has taken up the position of GTS Consultant with CSL Australia in Brisbane.

Max McCann has taken up a part-time position as a naval architect with One2three Naval Architects in Sydney while completing the requirements for his degree.

Tom Ryan has moved on and has taken up the position of Technical Manager Professional Services with Aus Ships Group in Brisbane.

Craig Singleton has moved on from GHD and has taken up the position of Unit Manager — Water Capital Portfolio with Shoalhaven Water in Nowra, NSW.

Jason Steward has moved on from the Capability Sustainment and Sustainment Group and has taken up the position of Regional Business Development Manager — Navy with DNV GL in Sydney.

Dylan Vandrunen, a recent graduate of the Australian Maritime College, has taken up a position as a naval architect in the in the Stability Technology Section of the Hydromechanics Cell in the Naval Technical Bureau's graduate program in Canberra.

Lily Webster, a naval architect in the Naval Technical Bureau's graduate program, has moved on from the Hydromechanics and Small Boats Cells and has commenced a six-month rotation at BMT Design and Technology in Melbourne.

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

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.

FROM THE ARCHIVES

A TALE OF TWO DOCKS

John Jeremy

After the outbreak of World War II there was a need to provide improved docking facilities in Australia — a need which grew as the war extended to the Pacific after the Japanese attack on Pearl Harbour. As part of the efforts to satisfy this need, which included the construction of the Captain Cook Dock in Sydney and the Cairncross Dock in Brisbane, two floating docks with a 1000 ton (1016 t) lifting capacity were built in Australia to a British design.

The docks, which were capable of being towed to any area, were fitted with a diesel generator in the port wall of the dock and a 2 ton (2.03 t) lift travelling crane on the starboard wall making them largely independent of shore services. The time taken to lower the dock and to raise it with the maximum load was 90 minutes.

The first dock (AD1001) was built by Evans Deakin in Brisbane. It was the third vessel to be laid down in their new shipyard, on 4 November 1940. Steelwork for the dock was fabricated at Rocklea and transported to the Kangaroo Point shipyard by road. The dock was launched on 24 April 1941. Acceptance trials on 3 September 1941involved the docking of the 456 ton (463 t) auxiliary minesweeper *Tambar* and the dock was handed over to the navy on 3 October.

AD1001 left Brisbane on 6 October 1941 for Darwin where it arrived on 4 November shortly before the outbreak of the Pacific war. At war's end, AD 1001 returned to Brisbane where it was laid up. In 1952 the dock was leased to the Melbourne Harbor Trust for the construction of concrete caissons for the extension of the Breakwater Pier. The dock was offered for sale in early 1958 but no offers were received and it was finally bought by the Melbourne Harbor Trust in March 1958, The MHT leased the dock to Hobson's Bay Dock and Engineering (HBE) for 30 years — it was renamed MHT Floating Dock No. 112.

By 1976 the cost of maintaining the dock had become prohibitive and HBE bought the dock so that they could dispose of it.

The dock was sold to Selco Shipyard of Singapore in August 1978 and it left Melbourne on 28 March 1979 under tow for Kuala Belait in Brunei where the dock remains today.

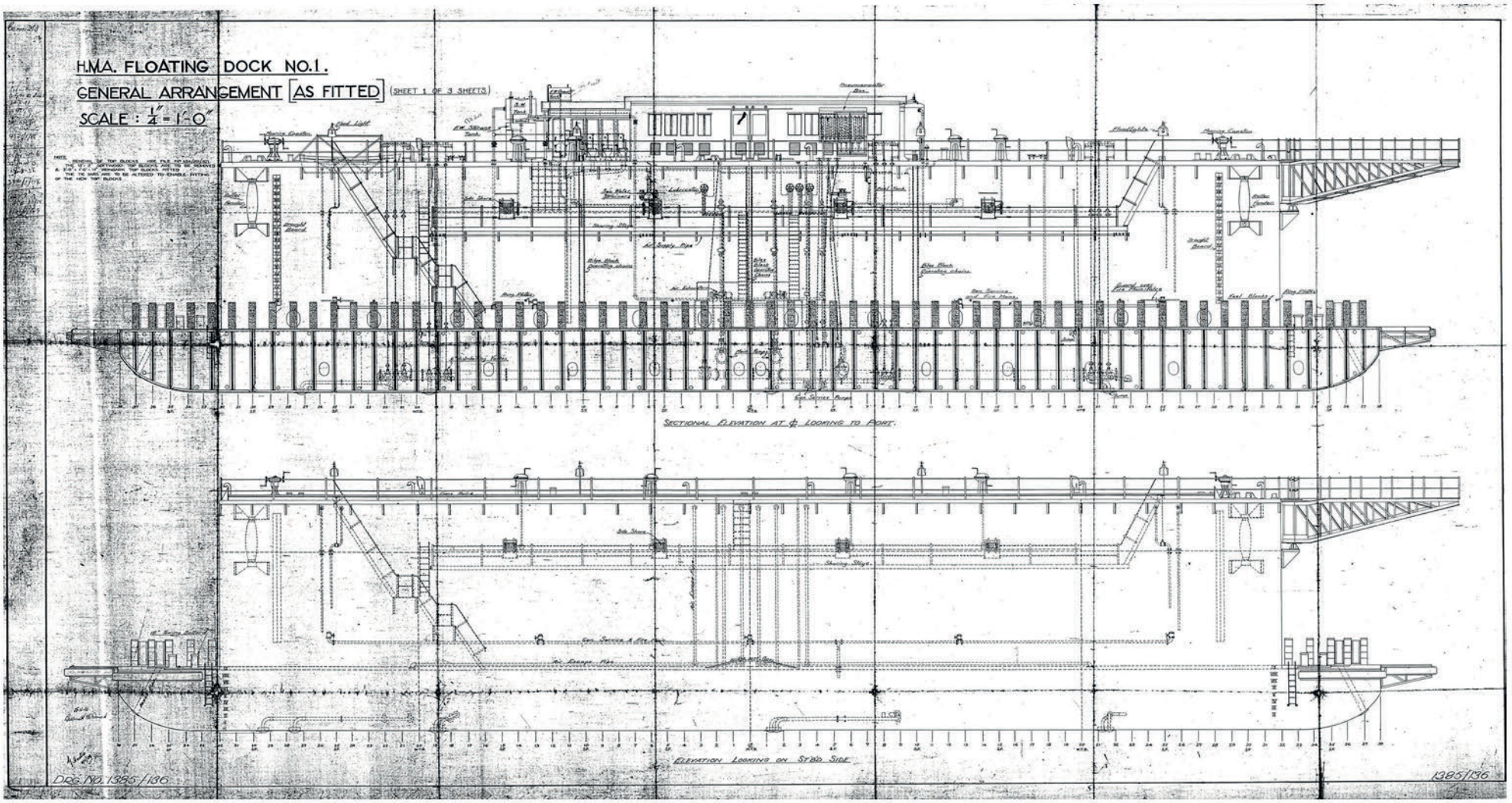
The second of the two docks, AD 1002, was built by Morts Dock and Engineering in Balmain, Sydney, and handed over to the RAN in 1944. With the approaching end of the war, AD 1002 was not deployed in the Pacific but remained in Sydney alongside the Garden Island Dockyard until it was finally decommissioned and laid up in 2011. Now owned by Noakes, the story of its resurrection for further service is told elsewhere in this edition of *The ANA*.

Reference

Betty, J. G. (2002), 'An Elusive Lady — Darwin's Floating Drydock', *Naval Historical Review*, Vol 23 No. 4

AD 1002 at Garden Island in June 2005
(Photo John Jeremy)

AD 1001 at Williamstown in 1958
(Photo John Jeremy)



The General Arrangement of AD 1001
(John Jeremy collection)

MV *Sycamore* arrives at Osborne South for docking on 12 April 2018
(Photo courtesy ASC Shipbuilding)