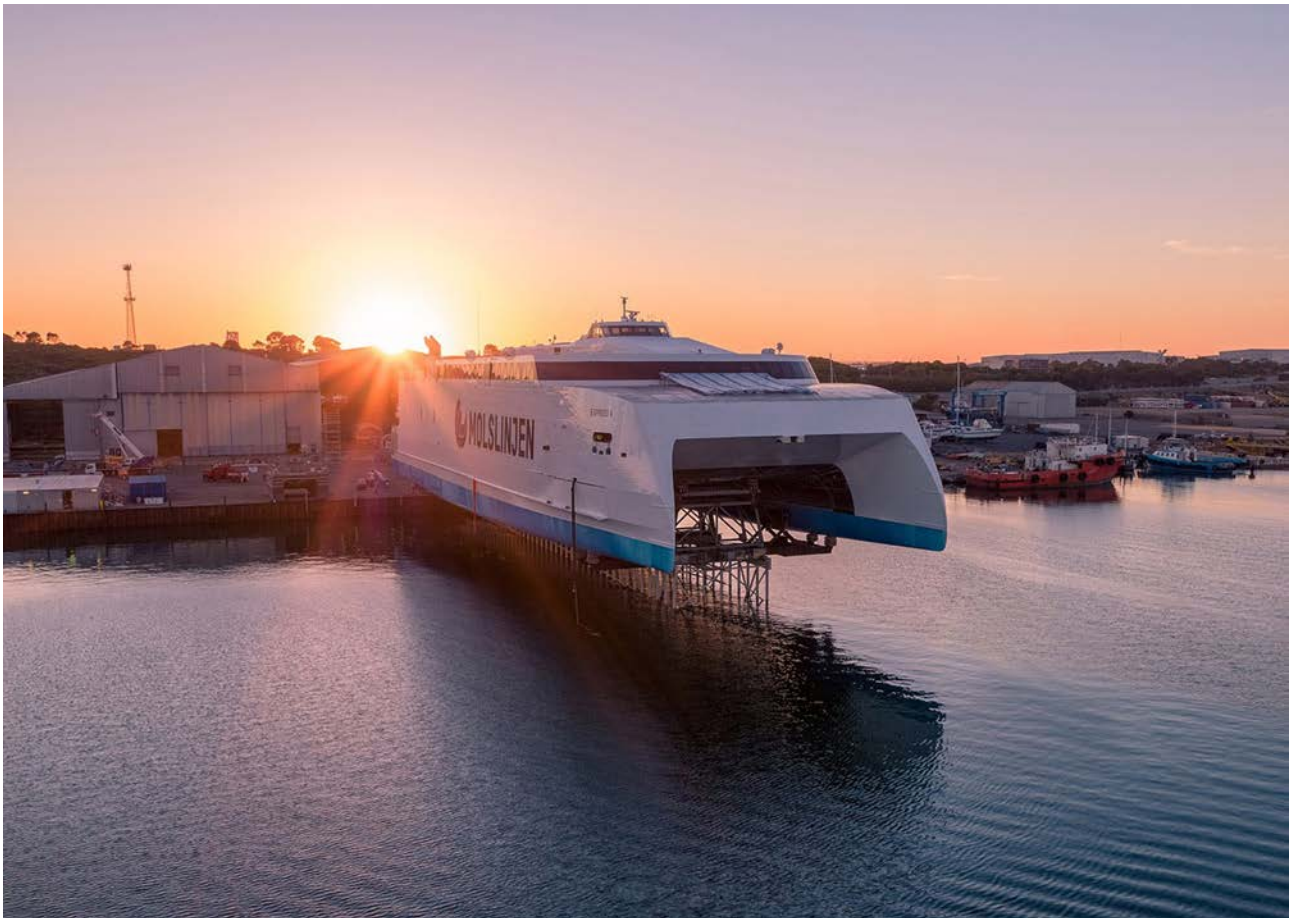
THE AUSTRALIAN NAVAL ARCHITECT



Volume 22 Number 4
November 2018

Night flying trials with F-35B Lightning fighter jets have been conducted during October off the United Kingdom's largest warship, HMS *Queen Elia beth*.

The new carrier has been fitted out with specially-designed LED lightning on her flight deck to aid night-time landings.

During the trials, conducted off the east coast of the United States, pilots initially used only ambient light and the lights on the carrier's deck, before later conducting landings using the night-vision capability in their helmets.

HMS *Queen Elia beth* is on track to deploy on global operations from 2021

(Photo courtesy Lockheed Martin)

THE AUSTRALIAN NAVAL ARCHITECT

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Volume 22 Number 4
November 2018

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The deadline for the next edition of *The Australian Naval Architect* (Vol. 23 No. 1, February 2019) is Friday 25 J an ry 9

Articles and reports published in *The Australian Naval Architect* reflect the views of the individuals who prepared them and, unless indicated expressly in the text, do not necessarily rep eset th views 6 th Is titu in Th Institu in its officers and members make no representation or warranty, ep essed o imp ied as to th accu acy, com p etea ss o co recta ss 6 info matin in articles o rep ts ad accep no responsibility for any loss, damage or other liability arisig from ay s e 6 th s p icatin o th info matin wh ch t co ains.

The Australian Naval Architect

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From the Division President

Welcome to another great edition of *The Australian Naval Architect*. As usual, it is full of very interesting information for us in the field, and we are really fortunate in Australia to have this superb publication.

I have mentioned in this column before that the Institution is conducting a strategic review, and that one of the working groups is looking at the publications policy. This is considering enabling the exchange of technical information through the Institution's publications, conferences and local meetings, including:

- scope, structure and delivery of conferences, workshops and seminars;
- scope and structure of publications; and
- how information is disseminated — printed, digital, online, social media, etc. — for future needs and expectations of the membership.

There is certainly a strong trend in general to move more and more to short snippets of information delivered electronically in a frequent manner. I personally get quite a number of such electronic newsletters, and find that I don't always have the time to read all the information that is coming to me — all for free! However, I'm not really sure that this is the sort of thing that the Institution should be moving towards.

We ought to be concentrating on more in-depth stories, including technical articles. However, there is now also quite a large number of peer-reviewed journals in our field, and it is not straightforward to see what the Institution's niche should be. Many years ago we held the Spring Meetings in London every year. These were well attended, and papers presented there were at the pinnacle of our profession. The discussions, and authors' replies, were recorded and all reproduced in the annual *Transactions* — a nice bound-covered volume. I recommend that people read through some of these old papers, along with the discussions. Some of them are quite interesting, and one can imagine the discussions going on at the Spring Meetings — how things have moved on!

I'm very interested in any thoughts regarding the direction of the Institution's publications which members may have. This is a very fast moving field, and I'm perhaps a bit out of my depth regarding the latest electronic communication technologies.

There is also the question about the future of conferences, and how the Institution should handle these. There are so many these days, a lot of which are regular events every two or three years, often run by academics primarily designed for other academics and researchers in their field. Most of the papers at these are deep technical ones in specific areas. There also seems to be an increasing number of conferences run by commercial conference-organising companies. In these cases some of the papers are just advertorials for the presenters' companies. However, often they are useful networking events, particularly when held in conjunction with a trade exhibition.

Again, it is not clear to me what the Institution's role regarding conferences should be into the future, and I'd certainly appreciate your thoughts on that role.

Martin Renilson

The Institution is also conducting a strategic review of how to best increase the internationalisation of the Council. Australian Division members may not be aware that it is now possible for Council members to attend the International Council meetings without being present in London. Until recently the technology for doing this has not been wonderful; however, the Chief Executive is putting considerable effort into improving the electronic conference facilities, so this will be a lot better in the future.

As President of the Australian Division, I am an ex-officio member of the International Council, so I attend most of them by teleconference (although I do manage to get to them when I am in the UK). Our Secretary, Rob Gehling, used to be a member in his own right; however, his term has expired. I recommend that members of the Australian Division consider nominating for Council, so that we can achieve a good representation for Australia. Members who may be interested could contact either Rob Gehling or myself for further information about how to nominate, and what the role entails.

On that note, members of the Australian Division who are interested in joining the Australian Division Council should be aware that nominations will be due by 12 December — see the information about this elsewhere in this edition. Again, if you are interested in putting your name forward please feel free to contact either me or Rob Gehling for further information. The Australian Division is only as good as the effort the Council can make it!

I recently attended the Final Year Research Project Conference at AMC. There were about 90 papers arranged into six parallel sessions. I couldn't attend all of them, but the ones that I did were generally impressive. This is all the more so when you consider that a large number of these students are from overseas and English is not their first language.

Equally impressive was the fact that over 30 external people

from the maritime industry came to assist with the assessing. Of co se, mo t o th m were fro u sid Tasmani a, ad th e th t I sp e to were imp essed with th q lity o th students. I know that some were there touting for future staff.

Eric Gb sch was award d th p ize fo b st p esen tio wh ch was sp o ed by th RINA Tasmani an Sectio ad AMSA. Th re is mo e ifi o matio ab th s elsewh re in th s eid tio Std en s ad g adu tes are th fu u e o p o essio d t was really g eat to s ee su h e n h ia sm.

Readers will be aware that the decision regarding the d sig o th fu u e frig te fo Au tralia, SEA 5 0 h s b en mad ad th t th Co m mw ealth Go v rm en h s ch s en th British BAE d sig o r its co p tito s. Th Australian version is to be known as the Hunter Class. What is interestig is th t, sh eq n to th Au tralian d cisio th Ca ad an Go v rm en also ch s e th same d sig fo its n w frig te.

Discussions continue regarding Australia's future submarine. Obviously I am not privy to the negotiations which are g g b tween th Au tralia ad Fre h b I d read a lo in th p ess com p ain g ab u lw lg th s is tak g Ho ev r, it is imp tan to realise th t th d tails o th Strateg c Partn rsh p Ag eemen are really imp tan if we are going to get a "regionally superior" submarine which can b main ain d and g ad d th g its lifetime. Th , we mu t g t it righ w , ad I feel th t th s may b wh t is influencing these negotiations.

Of co se, th re are alway th e in th p ic wh criticise an h g th t th Go v rm en ad in p rticu ar, Defe e, d s. Mo t o th s seems to b b sed o ig an e, su h as the well-publicised criticism of the use of a pumpjet for these b ts. P m p et techb g is h g y sen itiv ad we are v ry lu k th t th Fre h are p ep red to sh re th s with us. Some of the nonsense that I've read in the public domain ab wh we sh d t b u ig m p ets is really q te in red b e. At th risk o p tig in a p g fo my k o n *Sh n a ie Hydrdy m ics*, p p e sh d read th sectio m p ets int hat b fo e say g a y h g

On a d fferen n te, I was co ern d to read th t Au tal's com p er sy tem h d b en h ck d Of co se, I h v o id a wh t th s mean , b it d sh t sd g Hack g techb g seems to b imp v g rap dly, ad th "arms race" may w be b tween th e th t h ck ad th e th t try to stp it o cu rig Ufi o tu tely, may o u d t d rstad wh t is g g o a d we d 't com p eh d th sophistication of what is possible for hackers to do. I've been involved in different defence-related organisations, and each seems to h v its w n p to o b s. Perh p th re n ed to b a lo mo e awaren ss fo th e o u th t d td rstad

The Institution is organising a stream again at the Australasian Oil and Gas Conference (AOG) in Perth, 13–15 March 2019. Th stream to c is *Offsho e Ma ie Techb g* ad it will p v d a fo m fo ith eractio o all p o essio ls in th area o o fsh e stru tu es, n v l arch tectu e and mari operations. Presentations from industry experts will reflect o th cu ren ad fu u e tech g es ad will fo s o engineering innovation in the changing industry conditions. This is being run again by the WA Section, which has formed a dedicated AOG Sub-committee. Please contact Yuriy Drobyshevski on yuriy@bigpond.com if you would like an f u th r d tails, o are ab e to a ssist.

There has been a lot of criticism in the press recently about foreign students coming to Australia and learning our technologies which they can adapt to improve their country's defence capabilities when they return home. I wonder whether the negative aspect of this is really sm ewh t o r ex g rated I'd lik to th nk th t th v ry sensitive technologies are kept well and truly under lock and k y (in lid g fro Au tralian std n s with o secu ity clearan e), ad p esm ab y th s is b ig mo to ed by DST Grpw h ri t is p rtn rig w ith a in v rsity.

Of course, the universities argue that they need to have th se fo eig std n s to g n rate th incom e n cessary to ru th ir p g am. I d t want to g t int o argu ents ab funding levels at Australian universities, but I see a far more important benefit to Australia by allowing these students to co e and stud h re. Wh lst h re, th y ll learn ab o v lu s and h w o d mo racy wo k . Hop fu ly, th y ll appreciate our form of government, and our lifestyle, which will influence them when they return home.

The Institution is one of only four non-governmental organisations participating in the IMO correspondence group which is finalising the Second Generation Intact Stability Criteria. The guidelines being prepared provide specifications for direct stability assessment procedures for th fo lw ig stab lity failu e mod s: p e lo s o stab lity parametric roll; surf-riding/broaching; dead-ship condition; and ex essiv acceleratio . Th se will be sub itted to th ne t meetig o th Sh Com mittee o Sh p Desig ad Co tru tio Please co tact me if yo wo d lik to k mo e ab th s imp tan n w d v lp m en fo sh p safety.

Fin lly, I want to men io th t I am p anni g to atted th Qu en sland Sectio s so ial ev n o th Gb d Co st o 9 No mb r. Alth I've b en to Qu en sland a few times o r th last co p e o y ars, th s will actu lly b my first visit to a Queensland Section meeting since becoming President. Of course, I will also be attending the SMIX Bash in Sy y o 6 Decemb r. I p to see as ma y memb rs at th se two ev n s as I can

Ma tiR ei lso

Editorial

In the May 2018 edition of *The Australian Naval Architect* we reported on the second visit to the wreck of Australia's first submarine, HMAS *AE1*, which lies over 300 m down on the sea floor off the Duke of York Islands in Papua New Guinea. The visit, in April, was made possible by the provision of the research vessel *Petrel* by Microsoft co-founder Paul Allen, who sadly died on 15 October at the age of 65. The expedition returned with around 250 hours of high-definition video and 8367 still images of wreck.

Over the following months a very detailed analysis was undertaken of the submarine which provided clues as to the possible reasons for her loss. This study has been summarised in a 180 page report, *Research Vessel* Petrel *Baseline Survey of HMAS* AE1, which was released by Find AE1 Limited and the Australian National Maritime Museum on 14 September 2018, the 103rd anniversary of the submarine's loss.

Examination of the very high quality images of the wreck revealed that the ship's ventilation valve in the pressure hull is about 60% open, confirming earlier views that the submarine was probably lost due to a diving accident. The open valve could have caused rapid flooding of the engine room, resulting in loss of control and causing the submarine to sink below crush depth. The implosion of the submarine forward of the engine room would have resulted in the instantaneous death of the crew. We will never know why the ventilation valve was open.

The ocean is a very unforgiving environment.

Australia's first submarines, *AE1* and *AE2*, were completed only 12 years after the Royal Navy commissioned its own first submarine. The submarine service had expanded very quickly in the years prior to World War I, and accidents were not uncommon. The E-class submarines were very advanced for their time and were the backbone of the RN submarine service during the war years. Of the four built, only two were lost.

As I write this on Remembrance Day 2018, I am reminded of the responsibility which falls upon those who design, build and maintain submarines, to ensure that they are not only fit for purpose, but safe. Those of us who were involved in the maintenance and refit of Australia's Oberon-class submarines were very aware of this responsibility. That program began in the aftermath of the loss of USS *Thresher*. *Thresher* was a new submarine which was lost on 10 April 1963 during her test deep dive after her post-delivery availability. The submarine passed below collapse depth (about 250 m) and imploded, with the hull fragmenting into six major sections.

The official inquiry into the loss of the submarine favoured the theory that a water pipe subject to fluid diving pressure failed, which caused loss of electric power and the reactor to scram (shut down) at a depth at which propulsive power was necessary for the submarine to surface. An alternative theory suggests that short-period line-frequency instability of the main electrical bus caused the main reactor coolant pumps to shut down resulting in an immediate scram of the reactor.

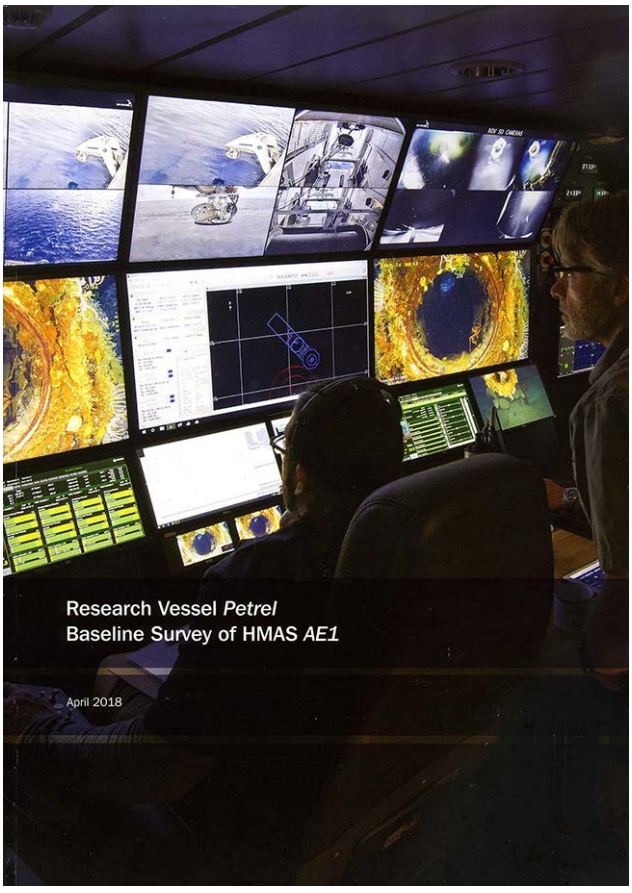
Whatever actually caused the loss of *Thresher*, the subsequent examination of systems in other submarines revealed disturbing defects and the initiation of the Submarine Safety Program (SUBSAFE). SUBSAFE was a quality assurance program intended to ensure that submarine systems were defect free and that the submarines were safe to operate as designed. From 1915 to 1963 the US Navy had lost 16 submarines from non-combat related causes but, after the SUBSAFE program began, lost only one, USS *Scorpion* in 1968.

In Australia a formal quality assurance system and rigorous testing program was introduced for the Oberon-class submarines which borrowed much from the practices adopted for the construction of nuclear submarines in Britain in the post-*Thresher* period.

Modern submarines are much more complex than *AE1*, yet the environment in which they work is just as demanding if not more so. I feel sure that those involved in the construction and maintenance of the RAN's submarines today are also very conscious of the responsibility they bear for the safety of the whole crew each time they go to sea.

The operation of a successful submarine service depends on teamwork between those who take the submarines to sea and those who, through their essential work ashore, enable them to do so. It is a relationship fostered through close cooperation and detailed knowledge of the submarines acquired during design and construction. The importance of this relationship is sometimes overlooked by those who are critical of Australia's future submarine construction task.

John Jeremy



The latest report on the submarine *AE1* can be downloaded from the Australian National Maritime Museum's website www.anmm.gov.au

imc 2019

PACIFIC INTERNATIONAL MARITIME CONFERENCE

INTERNATIONAL CONVENTION CENTRE SYDNEY, AUSTRALIA

8 - 10 OCTOBER 2019

PRELIMINARY ANNOUNCEMENT AND CALL FOR ABSTRACTS

KEY DATES

- Abstract Submissions Open & Call for Papers
  19 November 2018
- Abstract Submission Deadline
  15 March 2019
- Author Acceptance Notification
  12 April 2019
- Registrations Open
  13 May 2019
- Refereed Paper Submission
  14 June 2019
- Full Paper Submission Deadline
  26 July 2019
- Early Bird and Presenter Deadline
  9 August 2019

The **IMC 2019** Pacific International Maritime Conference, to be held in conjunction with the ***PACIFIC 2019*** International Maritime Exposition, will offer insightful presentation in to all facets of ship and submarine technologies, including:

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

Organised by The Royal Institution of Naval Architects, Institute of Marine Engineering, Science & Technology and Engineers Australia, **IMC 2019** will coincide with the prestigious Royal Australian Navy Sea Power Conference and the ***PACIFIC 2019*** International Maritime Exposition which is organised by Industry Defence and Security Australia Limited.

Abstract submissions open from 19 November 2018 and prospective authors are invited to submit an abstract relating to the conference program topics in accordance with the instructions on abstract format and guidelines available on the conference website menu.

Abstracts are to be submitted online at
www.pacificexpo.com.au/imc2019

For further information contact the
PACIFIC 2019 International Maritime Conference Secretariat at:
PO Box 4095, Geelong VIC AUSTRALIA 3220 **P**: +61 (0)3 5282 0543 **F**: +61 (0)3 5282 4455 **E**: imc@amda.com.au
www.pacificexpo.com.au/imc2019

COMING EVENTS

NSW Section

The nineteenth SMIX (Sydney Marine Industry Christmas) Bash will be held on Thursday 6 December aboard the beautifully-restored *James Craig* alongside Wharf 7, Darling Harbour, from 1730 to 2130. This party for the whole marine industry is organised jointly by RINA (NSW Section) and IMarEST (NSW–ACT Branch). Join your colleagues in the maritime industry and their partners for drinks and a delicious buffet meal on board the nineteenth-century iron barque. Dress is smart casual, but absolutely no stiletto heels! Cost is $90 per head.

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

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

There is a maximum limit of 250 attendees on the James Craig and we have had to turn away members and friends in previous years; so you are encouraged to book early.

AOG 2019

Australasian Oil & Gas Exhibition (AOG) is a three-day event being held from 13 to 15 March 2019 at the Perth Convention & Exhibition Centre in Perth.

Following its successful participation in AOG in previous years, the Royal Institution of Naval Architects will again be organising a conference stream at AOG 2019. Expressions of interests and submissions of abstracts were sought from members of the international maritime industry, and closed on 30 September.

The RINA conference stream *Offshore Marine Technology* will cover offshore structures, naval architecture and marine operations, and provide a forum for the interaction of all professionals in the area of offshore structures and vessels. Submissions which reflect the current oil and gas market, and focus on its economic implications and engineering innovation for the offshore industry have been targeted.

Attendance at the conference stream will be complimentary for the AOG Exhibition delegates.

For more information about AOG Events and the 2019 conference, visit http://aogexpo.com.au/conference/overview/, or for details of the RINA conference stream, contact the WA Section Committee at wa@rina.org.uk.

Pacific 2019 International Maritime Conference

The Pacific 2019 IMC, organised by the Royal Institution of Naval Architects, the Institute of Marine Engineering Science and Technology and Engineers Australia, will be held in conjunction with the Pacific 2019 International Maritime Exposition at the International Convention Centre in Sydney from 8–10 October 2019.

Abstract submissions now open; see details on Page 5.

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 10–14 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 or 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.

The RAN at work — HMAS *Melbourne* (foreground) on standby to conduct a replenishment at sea with USNS *Carl Brashear* (centre)
(RAN photograph)

NEWS FROM THE SECTIONS

Western Australia

The Western Australian Section is proud to announce its involvement in next year's AOG 2019. We will have a booth at the event and will be organising a stream of presenters as part of the Technical Forum. Invited speakers will present across the disciplines of Renewable Energy, Offshore Installation, Marine Operations and Floating Systems. Organisation of the event is supported by Trevor Blakeley, the RINA Chief Executive, who will also be attending the event.

To date the line-up of confirmed speakers and subject areas include:

David Field of Icon Engineering (Perth), will be talking about new subsea technology in the form of the innovative CAN-Ductor which inserts a drilling conductor into the sea floor using suction pile technology thereby reducing drill rig time in the field and offering reduced costs and lower operational risk. The technology is developed from conventional anchor holders.

Ian Sherrington of Waves Group (Ltd) will be talking about the European offshore wind energy market. Waves Group over the past twenty years have been a leader in establishing the technical design and installation requirements for fixed and floating wind farms. Ian will share his learnings and offer insights into the offshore development of renewable energy in Australia.

Jan Flynn of Woodside Energy (Perth) will offer insights into the synthetic storm approaches to modelling and evaluating planning criteria at specific sites. This includes the variation in storm scenarios, such as cyclones in North Western Australia, which offer significant challenges in predicting characteristics such as intensity, frequency, scale and track.

Captain Walter Purio is the CEO of the LNG Marine Fuel Institute (Perth) which is seeking to realise environmental benefits and energy security across Australia. Walter has been instrumental in raising the profile of LNG as a future ship fuel and solution to Australia's energy security. Walter will share progress of the adoption of LNG-fuelled bulk carriers in Australia.

Jeff Baker of Lloyd's Register (Perth) will discuss the challenges involved with bunkering LNG-fuelled ocean-going vessels, through truck-to-ship, shore-to-ship or ship-to-ship LNG transfer. Jeff is the business development manager for Lloyd's Register Australasia.

Abstracts and speaker biographies will be available as we get closer to the event.

To embrace local expertise and developments in naval architecture, RINA WA Section is seeking expressions of interest for short electronic poster presentations in the form of an e-poster, run from the RINA booth.

Electronic posters will be delivered on a flat-screen monitor and allow for animation, audio, and video to enhance interaction between the presenter and the audience. The e-posters will be scheduled during the AOG session breaks and held at RINA's booth. Each presenter will be allocated 15 minutes with an additional five minutes allowed for discussion. The content of each e-poster will be required to be technically sound, follow the stream guidance areas noted, and be non-commercial, for consideration and acceptance by the RINA WA Sub-Committee.

Expressions of interest in the form of an abstract should be submitted to RINA for consideration (ow a@rina.org).

Over the past couple of months, a committee has been working together with AOG and RINA Ltd to ensure that RINA puts its best foot forward. This is an exciting step for RINA here in Australia and in the West as the energy and mining industries re-emerge from a few quiet years.

Tim Gourlay

New South Wales

Committee Meetings

The NSW Section Committee met on 4 September and, other than routine matters, discussed

- SMIX Bash 2018: Committee has met and arrangements are progressing for the upcoming event.
- TM Program 2019: Proposals for presentations at technical meetings in 2019 were canvassed, and a half a dozen are to be followed up.
- Emails: Process for sending emails from Australian Division to section members to be checked.
- Professional Affairs Committee: Jason Steward has accepted an invitation to re-join the Professional Affairs Committee of RINA in London.

The NSW Section Committee also met on 30 October and, other than routine matters, discussed

- SMIX Bash 2018: Registrations have started slowly, and we need the booking information to be disseminated more widely. Sponsorships are being sought to reach our target.
- TM Program 2019: Proposals for presentations at technical meetings in 2019 have been checked, with more to be followed up. A CBD venue to be trialled.
- Recording of Technical Presentations: Ways and means of recording presentations to be checked.
- RINA Logo: Use of the RINA logo on shirts, etc, to be checked.
- Discount for members for registration at Pacific 2019 IMC to be checked.

The next meeting of the NSW Section Committee is scheduled for 12 February 2019.

Environmental Solutions for Ships

Daniel Bellagamba, Account Manager Australia East Coast and New Zealand with Wärtsilä Australia, gave a presentation on *Environmental Solutions for Ships* to a joint meeting with the IMarEST attended by 24 on 4 September in the Harricks Auditorium at Engineers Australia, Chatswood.

Introduction

Daniel began his presentation with a brief introduction to Wärtsilä Corporation, which currently employs nearly 19 000 professionals at 110 locations in 70 countries around the world. The company's annual turnover is of the order of

€5 billion, providing marine solutions, energy solutions and services. Marine solutions (34% of total business) comprises the five segments merchant, offshore, cruise and ferry, navy and special vessels (such as fishing vessels, dredgers, etc.), and provides a comprehensive solutions portfolio. Daniel focussed his presentation on three areas: propulsion efficiency, exhaust gas cleaning systems, and ballast water management.

Propulsion Energy Efficiency

The aim here is to lower the environmental footprint through propulsion efficiency solutions. Key drivers for energy efficiency include the need to cut costs and improve operational efficiency, maritime regulation, and technological advancements.

The target of energy efficiency is to minimise the energy consumed during the whole lifecycle of a vessel. Fuel is the major contributor to the operating cost of the ship. Benefits include:

- Direct cost savings: Savings increase and investment payback times shorten as fuel costs increase.
- Increased competitiveness: Better profitability, offering a possibility to invest in further differentiation and increased revenues.
- Positive effect on brand image: Minimising the environmental footprint with compliance to current and upcoming regulations.

Propulsion efficiency plays an important role in the reduction of fuel consumption and the operational costs of vessels. Wärtsilä has decades of in-house experience of hydrodynamics, extensive knowledge and experience of the entire ship system which helps to develop efficient propulsion systems, can optimise solutions to specific customer requirements, utilises the latest numerical methods for calculations such as computational fluid dynamics (CFD) and model testing, and so can help improve a vessel's energy efficiency.

Here Daniel showed a video on propulsion energy efficiency and some of the improvements which can be made by way of propeller design, wake-improvement devices, propeller boss cap fins, Costa propulsion bulbs, nozzles and two-speed gearboxes [*This video is available at https://www.youtube.com/watch?v=zlxugTOxk&t=4E*].

Propeller Optimisation

For a typical propeller, the energy power is distributed as follows:

Rotational losses	5%
Frictional losses	5%
Axial losses	20%
Efficiency	60%
Total	100%

If a vessel changes its operating profile, then there is often a change in operating speed and power requirements, different optimal propeller characteristics, and the existing propeller design may not be suitable for the actual vessel operation. For an optimal solution the requirements must be determined. Is it fuel savings? An increase in bollard pull? Solution of noise and vibration issues? Solution of cavitation erosion analysis? Wärtsilä can investigate the optimal propulsion system by way of a fixed-pitch or controllable-pitch propeller, advantages of the devices shown in individual boxes.

Here Daniel gave an example of a fixed-pitch propeller optimisation

Item	Original	New Design
Propeller dia.(m)	9.0	9.0
No. blades	6	5
Blade area ratio	0.9	0.7
Mass (t)	10	6
Efficiency gain		3.6%

The larger diameter increased the propeller efficiency, and the reduction in number of blades and blade area ratio reduced the frictional losses.

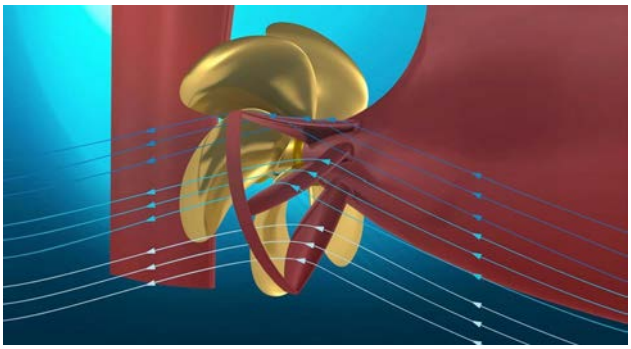
And an example of a controllable-pitch propeller optimisation

Item	Original	New Design
Propeller dia.(m)	7.0	7.0
No. blades	4	4
Blade area ratio	0.8	0.6
Blade mass (t)	5	4
Efficiency gain		4.5%

The reduction in blade area ratio reduced the frictional losses.

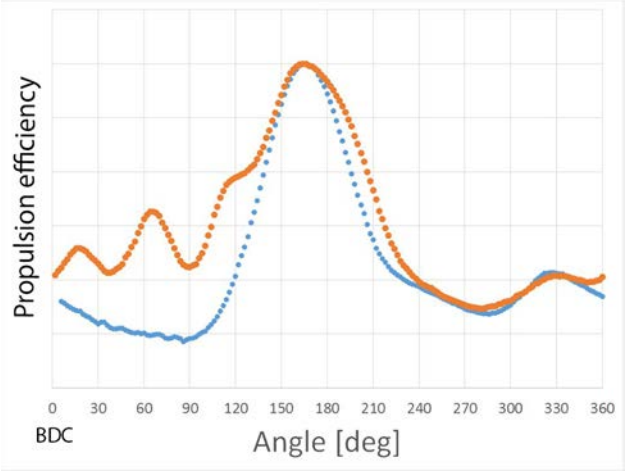
Wake Improvement Devices

Wake improvement devices aim to improve the inflow to the propeller by guiding one side of the stern flow in the opposite direction to the propeller rotation, generating pre-swirl. Devices such as Wärtsilä's EnergoFlow consist of multiple curved fins and a ring attached to the ship's hull to prevent the power losses which typically occur in a propeller's slipstream. The curved fins enhance the propeller's efficiency while keeping resistance at acceptable levels. The rig reduces the tip vortex and levels to the peak stresses which occur in severe loading conditions such as slamming



Wärtsilä's EnergoFlow wake improvement device
(Image courtesy Wärtsilä)

The propeller blade efficiency varies during one revolution depending on the local inflow due to the wake field. The blue curve in the accompanying diagram shows the variation in blade efficiency over one rotation for a four-bladed propeller. After applying Wärtsilä's EnergoFlow, efficiency increases mostly between 0° and 120°, which is the zone of the upward-moving blade, as shown by the orange curve.



Efficiency gain due to Wärtsilä's EnergoFlow wake improvement device
(Image courtesy Wärtsilä)

Propeller Boss Cap Fins

Propeller boss cap fins aim to reduce rotational losses. The cap fins reduce the boss vortex strength significantly and recover kinetic energy from induced rotation. They are applicable to all vessel types, and provide an average energy saving of 2%. The EnergoFlow is Wärtsilä's device.

The vortex coming from the propeller can cause cavitation damage on the rudder. Installing cap fins can reduce rudder damage due to reduced boss vortex and installation of the cap fins does not affect the manoeuvrability of the vessel.

Installation of the cap fins can be performed by a shipyard during dry-docking, or afloat with the help of divers, typically taking one day.

Wärtsilä has had more than 100 EnergoFlows installed since their introduction and can provide service engineers for local installation support.

Nozzles

Nozzles, or the application of ducted propellers, are suitable for vessels with high propeller loads, such as tugs, trawlers, seismic vessels, dredgers, and the like. Typical benefits include an increase in bollard pull, and a reduction in noise and vibration.

Process

A typical process for a Wärtsilä propulsion optimisation takes place in three stages:

1 QuickScan

This involves an investigation of the operating profile, propeller diameter, number of blades and optimal RPM, with rudimentary calculations and a rough estimation of savings. This results in a one-page report which is free of charge.

2 Detailed Study

This involves a propeller pre-design and an accurate calculation of savings, and results in a full report.

3 Engineering Project

This involves model testing, and all documentation required for manufacturing and installation, and detailed design.

Propulsion Examples

Here Daniel gave a number of examples of vessels which Wärtsilä had investigated and for which they had provided propulsion energy efficiency improvements, including a large fishing vessel, a fleet of twelve 9000 TEU container vessels, a twin-screw ferry, a fleet of six 6700 TEU container vessels, a reefer ship, a research vessel and a cruise ship.

Exhaust Gas Cleaning Systems

Daniel next turned the focus onto exhaust gas cleaning systems, and began with a world map of the existing and future emission control areas (ECAs). Existing areas include the east and west coasts of the USA and, in Europe, the North and Baltic Seas. Future areas include the coasts of Mexico and the remaining coasts of Europe, the coasts of Japan, and some coasts of China.

The International Maritime Organization (IMO) is standing its ground on the enforcement of the 2020 sulphur cap which means that, as of 1 January 2020, ships will be banned from burning any marine fuel with a sulphur content above 0.5%. IMO's Sub Committee on Pollution Prevention and Response (PPR) has approved draft amendments to the MARPOL convention on the prevention of pollution from ships (MARPOL Annex VI) to prohibit the carriage of non-compliant fuel oil. The exception would be ships fitted with an approved "equivalent arrangement" to meet the sulphur limits—such as an exhaust gas cleaning system or so called "scrubber"—which are already permitted under Regulation 4 of MARPOL Annex VI. More than 70 ships will be affected by the regulation.

In a recent report, Clarkson Research stated that more than 25% of the global orderbook is confirmed with a scrubber. However, this only translates to 3% of the entire fleet. Clarkson data suggests that come 1 January 2020, when the sulphur cap kicks in up to 90% of the global merchant fleet will be relying on more-expensive compliant fuel to power their ships.

Alternatives for Reducing SOx

For the 2020 deadline, there are essentially four choices available:

- Using very-low-sulphur fuel oil or compliant fuel blends (0.5% sulphur). This requires only a small investment and is flexible, but has a high operating cost based on present fuel prices, and there is a question mark about availability of such fuel.
- Switching from high sulphur fuel oil to marine gas oil or distillates. This requires only a small investment and is convenient, but has a high operating cost and there is a question mark about future availability.
- Retrofitting vessels to use alternative fuels such as LNG or other sulphur-free fuels. This substitution also reduces NOx and particulates, but has a high investment cost, and LNG is not entirely widely available.
- Installing exhaust gas cleaning systems (scrubbers), which allow operation on regular high sulphur fuel oil. This work with high sulphur fuel oil, has the lowest total life-cycle cost, is used everywhere and is easy to operate, but the payback period is heavily on the fuel price difference between low-sulphur and high-sulphur fuel oils.

Considerations

The global demand for distillates is likely to increase, so the price of MGO is expected to increase while the price of HFO is expected to stay the same or even decrease.

Scrb rs h v b en d mo trated to wo k in th mari ei rm en , and allw fo th same b k rig and same eig n p ration as b fo e. En op an ad No th American sh p ECAs are alread in fo ce, ad mo e are exp cted Wärtsilä h s a larg p tfo io 6 mari scrb r sb tu ins which are fit for new buildings and retrofits, and for any eig n adb ler b ad .

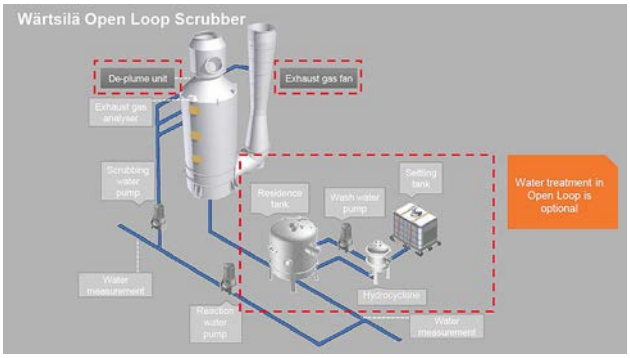
Wärtsilä Scrubber Systems

Wärtsilä h s th ee tp s 6 scrb r sy tems:

Op n lp rub r

This system operates in an open loop utilising seawater to rem SOx from th eh s t. Eh s t g s en ers th scrubber and is sprayed with seawater in three different stag s. Th sl ph in d in th eh s t reacts with water ad fo ms sl ph ic acid Ch micals are n req red sin e th n tu al alk lin ty 6 seawater n tu alises th acid Wash water from th scrb b r is treated ad mi n to ed at th ih et and outlet to ensure that it conforms with the IMO discharge criteria. It can th n b d scha rg d in o the sea with n risk 6 h rm to th ei rm en .

Th s is th main altera tiv fo o ean-go g sh p ad an easys b tu in



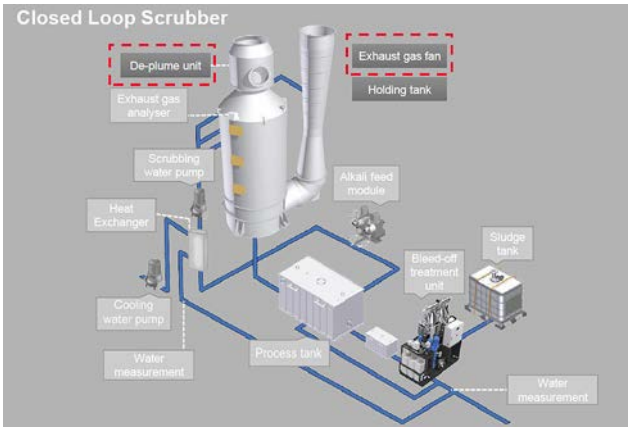
Wärtsilä's open-loop scrubber system
(Image courtesy Wärtsilä)

Clo ed-lp rub r

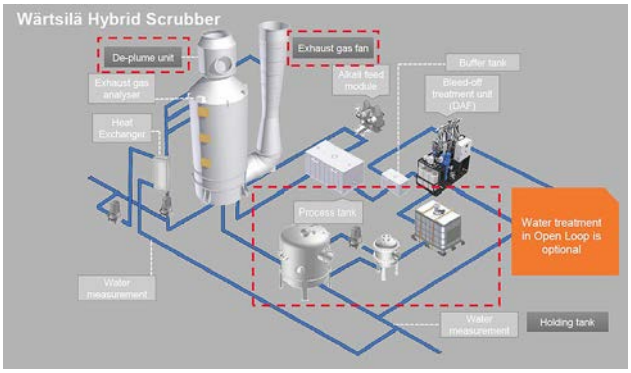
In th s sy tem, th eh s t g s en ers the scrb r ad is sp ay d with sea water wh ch h s b en mix d with cas tic soda (NaOH). The sulphur oxides in the exhaust react with th s mix u e ad are n tu alised A small b eed-6 f is extracted from the closed loop and treated to fulfil IMO requirements. Cleaned effluents can be safely discharged v rb rd with n h rm to th env rm en . If p ration in zero-discharge mode is requested, then the effluent can be led to a holding tank for scheduled and periodical discharge. This would be the choice for seas with extremely low alk lin ty ad fo op rato s lk g fo cn in d clo ed lp ration

Hyb id8 rub r

Hybrid solutions have the flexibility to operate in both open- and closed-loop modes. This provides a flexibility of operation in low-alkaline waters as well as the open ocean. The hybrid approach enables operation in closed lp md wh n req red fo ins tan e wh lst in p t ad d ig man u rig s ig NaOH as a bfi fer. Th sy tem can be operated in zero-discharge mode for a limited period. Wh n at sea th switch can b mad to p n lp s ig h ys eawater.



Wärtsilä's closed-loop scrubber system
(Image courtesy Wärtsilä)



Wärtsilä's hybrid scrubber system
(Image courtesy Wärtsilä)

This would be the choice for ships requiring full flexibility 6 p ratin .

Scrubber Examples

Here Dan el g v a m b r 6 ex mp es 6 v ssels wh ch Wärtsilä h d in stig ted ad fo wh ch th y h d p v d d scrb r sb tu ins , in lid g a 0 0 d w t p d t tak r, *Harmony of the Seas* (the biggest cruise vessel with the b g st scrb rs!), *Clip r Quito* ad *Clip r Po h* (th first of a series of very large gas carriers), and *Thu t a* (car carrier). To d te, Wärtsilä h s sp ied v r 0 scrb rs, maih y to cn ain r v ssels (%), h in lid g VLCCs, tak rs, ro ro v ssels, b k carriers, cru se v ssels, ro p x v ssels ad rawlers.

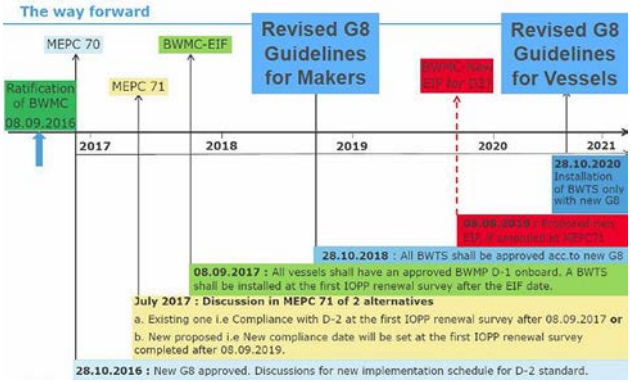
Th lead times fo a p j ect are tp cally 8 weeks fo feasibility and budgeting up to the award of a contract, and then 9–10 months for engineering, procurement, cn tru tin ns tallatin t estig d rials.

Ballast Water Management Systems

Daniel next turned the focus onto ballast water management systems, and began with a video of the threat posed by b llast water tras p t ad Wärtsilä's sy tems [*This video is available at https://www.youtube.com/watch?v=M2oAol_dxPY* — Ed , fo lw ed by d tails 6 th imp emen tatio schedule required by IMO's *Guidelines for Approval of Bu ls t Wu er Mg men S stems (G8* , ap ed on 8 Octb r 0

Ballast water treatmen sy tems wh ch will b is talled (ie . delivered on board a vessel) prior to 28 October 2020 should be certified either with the existing G8 (2016) guidelines or th rev sed v rsin Th latter allw s early mo rs to s e

th ir ins talled sy tems as lg as th y main ain ad p rate them properly. The revised guidelines will be applied n BWTS wh ch start th ir Tp Ap w l p o ess fm 8 Octb r 8 w ard . Ins tallatin fm 8 Octb r 2020 onwards should be with BWTS certified with the rev sedg d lin s.



Ballast water treatment system implementation schedule
(Image courtesy DNV GL)

Treatment Systems

There are two main types of ballast water treatment systems: n s ig electro-ch o in tin wh ch can treat mo e th n 0 m³/h ad is su tab e fo tak rs ad b k carriers, ad n s ig l tra-vib et lig wh ch can treat p to 0 m³/h ad is su tab e fo cn ain rsh p ad mo t o h r v ssels. Bo h re tp ap w da dU SCG cm p ian .

For an electro-chlorination system, the typical scope of sp y in ld s th main cn rb p n l, EC pw er sp y, side-stream pumps, electrolysis cells, dosing/degassing unit, neutralisation unit, static mixer and filter.

For an ultra-violet system, the typical scope of supply includes the main control panel, UV power supply, filter adJ V treatmen in t.

Retrofitting options can include supply only, engineering, site aid so y,a d cm p ete ins tallatin

Steps to Compliance

Th fb lw ig re th s u l six tep tc m p ian e:

In tih P h e

This phase covers collection of data on the vessel and its operating profile, preliminary price indications based n similar p ev s p j ects ad estimates, ad ch ce 6 tech g d s e,m d ar o b sp sy tems.

Co ep

An h rd techn cal sn v y 6 th v ssel is carried u , and an equipment configuration developed based on the survey and proposed BWMS setup. Capital expenditure and p ratig ep nditn e estimates are made, ad a tech cal feasib lity ep t p ep red

Bs icE g a erig

The proposed installation site of the vessel is 3D laser scanned in order to produce full mechanical and engineering drawings and documents for the installation. Dialogue is opened with the classification society for preliminary approvals, sub-contractors are selected and a firm offer and cn ract fo sp ym ad .

Detl edE g a erig

This includes detailed mechanical and electrical engineering, production drawings, including steelwork detailed drawings, welding details, and foundation drawings, capacity calcl atin ad d ag ams, eq m en ad x l lists, class ap w ls fo d awig ,a cp o n emen .

Ins th la in

Eq m en is d liv red fo p efab icatin ad ins tallatin with system delivery as loose kit or pre-assembled modules, including all components mounted on skids and internal cabling connected, followed by installation at the yard during d k g ad ins tallatin h rd b fo e ad after d k g

Cm missin g

Testing and commissioning includes crew training in operating the system, flag and class approvals, and handing v r ad s tart 6 life-cy le sp t

Wa rta y

The warranty period is typically one year. Life-cycle support in ld s g ran eed av ilab lity 6 sp re p rts ad serv ces th g th life 6 th sy tem, ad g ran eed serv ce n two ka da v ilab lity.

Wärtsilä's BWMS

Wärtsilä has 11 000 service professionals with leading technology know-how in many countries of the world. They have ballast trained personnel in the UK, Korea, China, Netherlands, Singapore, USA, Italy, Finland, India, Greece, Fran e, Germay , No way, Jap n, Tn k y ad UAE, ad mo e are com ig

Th Wärtsilä Lad & Sea Acad my also rs cn ses in Ballast Train g [*The Wä tsilä Ld & S a Acde my hs operations in 12 countries, and runs a huge number of courses (listed in the Training Program Catalogue) intended fo p rs l f n Wä tsilä eq i m en w r, see http ://wwww a tsila n /wlsa–* Ed]

The vote of thanks was proposed, and the certificate and "th k" b tle 6 win p esen ed G eo g Cn ran

Daniel Bellagamba (L) accepting the "thank you" bottle of wine and certificate from George Curran
(Photo Phil Helmore)

Wild Oats XI Bow Extension Project

Warren Miller, Senior Design Engineer with Composites Consulting Group (a Diab Group company), gave a presentation on the Wild Oats XI *Bow Extension Project* to a joint meeting with the IMarEST attended by 19 on 3 October in the aid to image at the Royal Prince Edward Yacht Club, Point Piper.

Introduction

Warren began his presentation with an introduction to Composites Consulting Group (CCG), which is an independent branch of the Diab Group providing businesses with the required competence in the design and manufacture of composite materials. CCG has extensive engineering and manufacturing experience from various industries giving them insight into their customers' needs. They provide structural engineering projects and mould design manufacturing inspection and refurbishing and training.

Their team of more than 90 engineers in seven countries offers 24/7 fast worldwide support. Various projects in Australia have included

- The *All Eyes on Us* sculpture, 7 m high, for the Commonwealth Games on the Gold Coast in April 2018
- *Ocius,* the 6 m Blue Bottle autonomous sailing drone from Ocius Technology (hull and deck, internal structure, mast base, etc)
- Kenwick (Perth, WA) railway station monocoque composite canopy.

Why Modify the *Wild Oats XI* Hull?

Over the years, *Wild Oats XI* has become more powerful, with the addition of water ballast and more sail area. This means that she can be driven harder, and driving into the back of a wave slows the boat for a start, and can even become dangerous.

Three years ago side lifting foils were fitted which could be extended on the leeward side to provide righting moment. In addition they were forward of the centre of gravity, and sported dedicated lifting foils.

However, they really needed the whole rig to be moved further aft, or the hull to be moved forward under the rig to provide more buoyancy forward and so reduce pitching. This is not easy to do

Wild Oats XI punching into the back of a wave
(Photo courtesy Diab Group)

The Rules

The International Sailing Federation (ISAF) is the world governing body for the sport of sailing. Their Offshore Special Regulations (OSR) of 2015 in Section 3.03.3(b) states:

"Any change in hull length and/or … shall have: The repair or modification designed and built in accordance with the requirements of a classification society recognised by the ISAF."

The original engineering of *Wild Oats XI* by SP Technologies was to ABS' *Guide for Building and Classing Offshore Racing Yachts,* 1994. However, the *Guide* is no longer updated or supported by ABS. It turns out that DNV GL is now the only classification society with rules applying to racing yachts, so the structural engineering criteria for the bow extension was based in accordance with GL's *Guidelines for the Structural Design of Racing Yachts ≥ 24 m*.

This is important, because they were wanting to move the keel and mast, which could easily be done on say, a TP52. However, the keel is not fixed on *Wild Oats XI,* but is a canting keel, and the current rules require that the vessel must be able to go with the keel fully canted. This has to be emphasised, so that keel could be moved

The Plan

A team of local experts was formed to design the modifications, including Wild Oats Racing, One2three Naval Architects, McConaghy Boats, and CCG performing the structural engineering tasks.

Instead of moving the mast and keel on the original hull, they had to make decisions about what to do. The plan they came up with was to

- remove 2m from the stern
- remove 12m from the bow; and
- replace the bow with a 2m extension

The easy part was removing the bow and stern sections, although they had to be careful where they cut, and what they cut. One goal was to lighten the vessel by removing material, one example being the removal of a large watertight bulkhead. They decided to cut the vessel forward of the dagger board cases, and to leave the forestay attachments in the same place. The rocker profile of the hull did not change much, as the vessel is very flat from the keel aft.

Wild Oats XI with the 11.2 m bow section cut away
(Photo John Jeremy)

Major Considerations

Hull Curvature

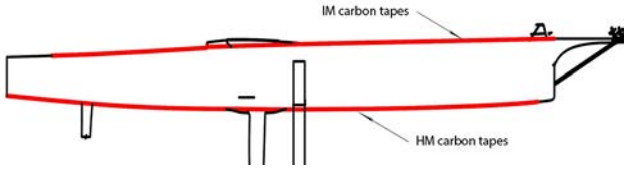
It was difficult to keep the sheer line of the vessel, and this was a major factor in deciding on the location of the bow cut.

Global Stiffness

Analysis showed that, with the forestay, backstay and mast

load, they had to allow for a total bending moment of the hull of 6 kN-m! That meant that, for global strength and stiffness, they had to have Intermediate Modulus carbon tapes on the deck and High Modulus carbon tapes on the hull bottom.

Carbon Type	Young's modulus	Ultimate strains	
	GPa	%	%
High-strength carbon fibres	130	1.1	–0.82
Intermediate modulus fibres	163	1.0	–0.71
High modulus fibres	208	0.75	–0.45



Carbon tapes on deck and hull for global strength and stiffness
(Image courtesy Diab Group)

The old deck was therefore cut away from the deck "planks" of carbon tapes, and the planks reinstated on the new deck

Hull under tow showing deck planks
(Photo courtesy Diab Group)

Joining

There were a number of considerations in joining the two extensions to the main hull:

- Custom geometry they had to avoid the dangerous rudder and props.
- They had to join as far aft on the tapered sides as possible to afford the existing pads.
- Longer laps for global tapes meant that it was advantageous to step forward the hull bottom.
- Due to lack of availability of wet-laid HM fibre they used the equivalent strength of IM fibres for both hull and deck global tapes.

The two extensions was joined to the main hull at the deck level with five plies inside and five plies outside the sandwich laminate construction

The two extensions was joined to the main hull sides and bottom with five plies inside and eight plies outside the sandwich laminate construction

Hull ready for joining
(Photo courtesy Diab Group)

McConaghy Boats did all the work, and they were amazing. They had done previous cut-and-join work, and so were familiar with the type of work required. A specialist, Peter

Hull join being vacuum bagged
(Photo courtesy Diab Group)

Britt from Forster, was brought in to oversee the join of the new bow to the hull. The join fit perfectly.

Mass Savings

A secondary aim of the project was to save as much mass as possible.

Interestingly, the ABS 1994 *Rules* required a minimum skin thickness, whereas DNV GL does not. This means, for example, that *Comanche* has laminate skins which are about half the thickness of *Wild Oats XI*'s original. As a result, the bow extension has lower skin thicknesses than the original, and the remaining existing honeycomb was replaced with aramid honeycomb, allowing for further mass savings.

The original estimated bow with structure was 5954 kg. The original topside mass was 8.4 kg/m², and the modified mass is [illegible] kg/m². The original bottom mass was [illegible] kg/m², and the modified mass is 10.96 kg/m².

In addition, there was removal of old supporting structure and implementation of simpler structure.

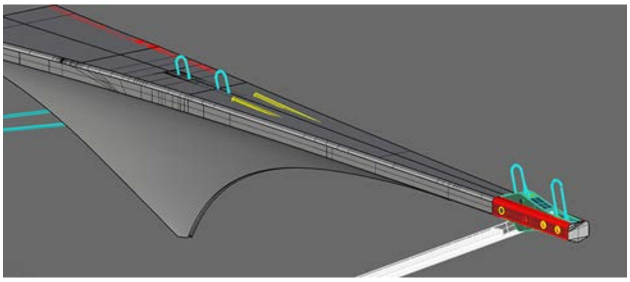
All of this gave rise to a total saving of [illegible] kg (including the modified bowsprit), or 12% of the hull mass.

Side Benefits

A side benefit of the bow extension project was the longer bowsprit. When the bow extension project was first planned, they thought that they would get away with a shorter (1.5 m) bowsprit. However, when the sailmakers became involved, they ended up with a longer (4 m) bowsprit than original! The benefit comes when handling headsails.

Older vessels (like *Loyal*) have to hank on headsails and, in heavy weather at night, it can take hours to change headsails. The new bowsprit on *Wild Oats XI* allowed the use of top-down furling headsails, which are easier to manage between sail locker and deck as a roll, and one can be hoisted on before the other comes off, so that the vessel is never without a headsail.

However, the tip of the new bowsprit was a real structural challenge, including a solid carbon bobstay. They spent almost as much time on the bowsprit engineering as on the hull!



Wild Oats XI new bowsprit
(Image courtesy Diab Group)

Results

The hull modifications have changed the yacht's performance, and the crew is now much happier with how she handles.

Downwind, *Wild Oats XI* can make a better VMG [*velocity made good; ie. towards a given waypoint* — Ed] by sailing 15° lower but at a slightly lower speed than, say, *Comanche.* One reason for this is that she has a lower wetted surface area and less frictional resistance.

Conclusion

The bow extension project for *Wild Oats XI* has involved removing 2 m from the stern and [illegible] m from the bow of the vessel, and replacing the bow with a [illegible] m extension. The structural analysis was complex and involved many decisions. The work was carried out by McConaghy Boats who did a wonderful job. The result has been the desired improvement in performance, which has kept the vessel competitive with contemporary modern designs, and the crew are very happy with what has been achieved.

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

Phil Helmore

Warren Miller (R) accepting the "thank you" bottle of wine and certificate from Jason Steward
(Photo John Jeremy)

CLASSIFICATION SOCIETY NEWS

Common Structural Rules Software Updated

Common Structural Rules Software LLC, a joint venture company formed by LR and ABS, has released a software update which simplifies compliance with current and pending IACS Common Structural Rules (CSR).

"The Common Structural Rules provide the industry route to compliance with IMO's Goal-Based Standards for tanker and bulk carrier structures," said LR Marine and Offshore Business Director, Nick Brown. "By working together, LR and ABS have provided fully up-to-date straightforward and accessible tools for the whole industry to use when applying CSR."

"As requirements change, it is imperative for classification societies to provide services and solutions which keep pace," says ABS Senior Vice President, Engineering and Technology, Derek Novak. "By updating this software, we ensure that our tools are effective and provide the best possible guidance to our users."

Improvements to this leading software facilitate compliance with existing and future IACS Common Structural Rules, providing users with an easy way to evaluate designs. Developed from the technical strength of LR and ABS, Version 2.5 of the CSR Prescriptive Analysis and CSR Finite Element (FE) Analysis software allows assessment of whole vessel structures — including new bulk carrier and oil tanker designs — using compliance information for the current CSR, which entered into force on 1 July 2015 as well as for the rule changes that come into force on 1 July 2018. Both class societies will use these tools to evaluate new designs against the CSR.

The updated CSR Prescriptive Analysis software can be used on both Windows 7 and Windows 10. A summary report provides required and offered scantlings with graphic representation of deficiencies. Reports summarise dominant criteria for each structure as well as data for every parameter value. Used with CSR FE aAalysis, this complete tool makes verifying CSR compliance possible with minimal effort. A new user interface for CSR FE Analysis software enables automatic picking or manual selection to display the stress reading points for Cruciform Flange, Cruciform Web and Bracket Toe hotspots. Results are added to verification results for Fatigue Assessment.

The software is now employed by over 1000 users. Regular updates for additional structural coverage and functionality will address ongoing CSR changes.

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

Lloyd's Register website, *News*, 5 August 2018

FROM THE CROWS NEST

Bluebird K7 Restoration

Bill Smith, the man who restored Donald Campbell's *Bluebird*, has said he does not want it to be locked away in a museum. Campbell died when *Bluebird* flipped and crashed during his attempt to break his own water speed record of 444 km/h in 1967. Bill Smith recovered the wreckage of the hydroplane in 2001 from Coniston Water in Cumbria and rebuilt it at a workshop on Tyneside.

Following successful test runs on Loch Fad in Scotland, where the restored hydroplane reached 150 mph (241 km/h), there have been offers for him to take it around the world. But there are also calls for it to be housed in a specially-built extension in the Ruskin Museum in Coniston.

The hydroplane is effectively co-owned by the Ruskin Museum Trust — which was gifted the wreckage in 2006 — and the man who restored it, Bill Smith.

He said that negotiations to bring it back to Coniston had stalled, leading him to carry out the test runs on the Isle of Bute in Scotland. Mr Smith said "The boat performed beautifully and there was a phenomenal amount of interest. It demonstrated very forcibly that this is not the sort of object that should be put in a museum." He said that, while it could be stored and displayed at the premises in Coniston, it needed regular maintenance and would have to "run on water".

"We've had offers coming in from all over and all sorts of places, including Australia and America. And if they want it, we can do it", he said. "It would be very sad if it was put in a museum and then doesn't show. People really need to see the power of it."

But Ann Hall, Chairwoman of the Ruskin Museum Trust and a parish councillor for Coniston, said that there was no reason why it could not run on Coniston Water. "The reason it went to Bute is because a quiet, shallow lake is needed," she said. "Coniston is different, it's a public highway."

But she said Coniston had "everything needed" to showcase the boat. "Once we've got a date we can all agree on, we can get a safety plan together that's right for the community," she added.

BBC News website, 5 August 2018

Restored *Bluebird* undergoing tests on Lake Fad in Scotland
(Photo courtesy The Bluebird Project)

Watch this space!

Look for the interested on the *Bluebird* Restoration Project Twitter page, https://twitter.com/bluebird_lagoon

Team Britannia

Team Britannia is a multi-million pound British bid led by ocean adventurer, Alan Priddy, to design and build *Excalibur*, the fastest and most fuel-efficient wave-slicing powerboat to circumnavigate the globe for the much-coveted Union International Motonautique world record, currently held by New Zealander Pete Bethune at 6d 9h 24m.

Excalibur was removed from her shed at ABC Marine on Haylings Island, UK, in early September and turned through 180 degrees so that the wheelhouse and stern were in the more-specious permanent building rather than the temporary structure, for work to continue.

There do not now appear to be any expected launch date, but it is expected that, following trials, the vessel will be moved to Gibraltar by the end of the year and, when the weather window is right, they will commence their record-

Excalibur being turned around
(Photo from Team Britannia Facebook website)

breaking around-the-world eco-challenge attempt.

For more details and photos, visit the Team Britannia Facebook page, https://www.facebook.com/teambritannia/.

Phil Helmore

GENERAL NEWS

BAE Systems Signs AWA for Hunter-class Frigates

BAE Systems Australia has signed an Advanced Work Arrangement (AWA) with the Australian Government for the Hunter-class Frigate Program.

The Australian Government announced in June that BAE Systems was selected as the preferred tenderer for the program to deliver nine future frigates for the Royal Australian Navy.

The AWA will allow BAE Systems to continue to mobilise the program including maturing design and engineering phase, establishing a skilled workforce and setting up the required infrastructure necessary to commence to progress in 2020.

BAE Systems' Managing Director for the Hunter-class Frigate Program, Nigel Stewart, said "This is a very important and early milestone in the development of an enduring world-class naval shipbuilding industry in Australia. The AWA demonstrates a commitment by both BAE Systems and the Australian Government to ensure timely progress against this critical defence program."

BAE Systems continues to progress negotiations with the Australian Government for the Head Contract for the Hunter-class Frigate Program and the acquisition of ASC Shipbuilding.

Major Milestones for Civmec

On 3 October two major milestones were achieved at Civmec's Henderson facility in Western Australia — the erection of the first steel for one of the world's largest modular shipbuilding halls and the preparation of the first steel for delivery to South Australia for Australia's new fleet of Offshore Patrol Vessels (OPVs).

Construction of Civmec's new facility is on track to meet the scheduled completion date of late 2019. The 350 m² (gross floor area), 70 m high, purpose-built facility will be one of the largest single-covered fabrication, repair and maintenance facilities in Australia.

Large enough to handle complete destroyers, frigates and OPVs, the facility will enhance Civmec's existing facilities on its 200 000 m² landholding at the Australian Marine Complex (AMC) at Henderson.

Designed to be one of the most efficient and innovative in the world, the new facility will be a significant piece of industrial infrastructure, adding a new world-class resource to the Australian maritime landscape and considerably enhancing the capability available in Western Australia.

Since the first sod-turning ceremony in December 2009, Civmec has continued to develop the site and after ten years, when fully operational, the Civmec complex will be capable of handling any of Australia's major projects for either the resource, infrastructure or defence sectors.

The facility will provide employment opportunities for up to an additional 1000 Australians, including 100 new apprentices and trainees, as capacity increases. Presently the company employs over 600 people across Australia.

Civmec's Executive Chairman, James Fitzgerald, said "At times like this, it's important to stop and reflect on the company's achievements. I would like to take this opportunity to thank everyone who has contributed to the company for their support and encouragement which has helped to get us to this significant moment. This facility will create employment for numerous generations to come. It will be a hub for training and innovation and will be a home-grown leader in the future of modern heavy engineering. It's a facility that Western Australians can identify with, can be proud of."

The other milestone was the preparation and profile cutting of Australian steel plate for the first of 12 OPVs to be constructed for the Royal Australian Navy.

In April 2018, Lürssen Australia awarded Civmec a significant contract for the new build program for the Royal Australian Navy's SEA 1180 OPVs. The contract included the supply and processing of steel for 12 vessels. The first two vessels will be built in South Australia by ASC, and Civmec will undertake the fabrication, construction and consolidation for the following 0 vessels in Western Australia.

This work program will be a key element underpinning Civmec's Henderson operations for the years to come.

"We are extremely pleased to be involved in the OPV program. Today represents an important step in our long term commitment to further supporting the establishment of a competitive Australian shipbuilding industry and supply chain which can export to the global market," said Pat Tallon, Civmec's Chief Executive Officer.

Present at the event were the Hon. Scott Morrison MP, Prime Minister of Australia; Senator the Hon Mathias Cormann Minister for Finance; Commodore Stephen Hughes, Director-General Littoral, Royal Australian Navy; and Peter Crowther, Assistant Secretary Ship Acquisition — Specialist Ships at CASG, Department of Defence.

HMAS *Anzac* arrives in Henderson for AMCAP upgrade

HMAS *Anzac* has arrived at BAE Systems Australia's Henderson facility in Western Australia for her AMCAP upgrade.

The Mid-life Capability Assurance Program (AMCAP) upgrade is being undertaken at Henderson by the Warship Asset Management Agreement (WAMA) Alliance.

HMAS *Anzac's* docking marks a milestone for BAE Systems, where she joins her sister ships *Perth* and *Arunta*. This will be the first time that three warships have been on the hardstand at the Henderson facility.

HMAS *Arunta*, the first-of-class AMCAP ship, most recently had her bow mast removed to make way for the installation of a newly-developed air-search radar system. The new mast was manufactured by BAE Systems and was scheduled to be installed at the end of October.

HMAS *Arunta* will undock before the end of the year after having spent more than 12 months on the hardstand. She will then undertake sea trials ahead of a planned return to service in 19.

The remaining seven ships will be back in service after upgrade by 29.

Tasmania Turns Down *Darwin*

The former Royal Australian Navy frigate *Darwin* will not be turned into an artificial wreck off the coast of Tasmania (as reported in *The ANA* August 8 page 9) as the island state's government decided not to accept the Commonwealth's gift. While the frigate was offered for scuttling off the East Coast for free, the Tasmanian government estimated that it would have to pay over $12 million to prepare and establish *Darwin* as an artificial wreck.

The Department of State Growth further found that it would cost approximately $600 000 per annum to monitor and manage the artificial wreck site that would not be covered by artificial permit receipts.

"We thank the Commonwealth for their offer; however, the costs associated with the project have rendered it financially unfeasible," the Tasmanian government said.

HMAS *Darwin* was commissioned in July 1989 the last of four guided missile frigates (FFG) built in the US for the RAN. Of the other three ships, *Adelaide* and *Canberra* are dive wrecks, and *Sydney* was broken up in Western Australia.

HMAS *Darwin* was decommissioned in December 2017 and offered as a gift to the Tasmanian government in August 18.

Cooperative Engagement Capability Tested

In a first for both navies, in early November HMAS *Hobart* successfully tested a communications capability, proving her ability to share sensor information and real-time combat system data with the United States Navy.

HMA Ships *Arunta*, *Anzac* and *Perth* ashore together at Henderson, Western Australia
(Photo courtesy Hugh Hyland)

During training and testing near Hawaii, HMAS *Hobart* established secure data links with the US Navy Arleigh Burke-class destroyer USS *John Finn* and shared tracking and fire-control data across the two ships.

The Minister for Defence, the Hon Christopher Pyne MP, said that the trials were a significant milestone in the testing and qualifying of *Hobart's* combat and weapon systems.

"These trials are the culmination of 12 months of preparations and demonstrate *Hobart's* formidable capability," Minister Pyne said.

"Australia is the first country outside the United States with cooperative engagement capability, and so this demonstration marked the first time this capability was proven between warships".

The Commanding Officer of HMAS *Hobart*, CAPT John Stavridis RAN, said that the visit to the US had proven how closely the Australian and US navies can work together.

"Contacting and sharing data with the US Navy like this is an important step in increasing our interoperability with them, especially during linked task group operations at sea," CAPT Stavridis said.

"Sharing information like this between ships at sea means that ships in a task group can have advanced tracking and targeting data."

"It means that a ship can detect and, if needed, engage a threat identified by another ship or aircraft, creating greater flexibility and better protection for all the ships involved".

Defence Support Services

In August Australian companies were invited to have their say on how marine support services for the Department of Defence should be delivered in the future. The then Minister for Defence Industry, the Hon Christopher Pyne MP, announced the release of a Request for Information for the Defence Marine Support Services (DMSS) Program.

The program includes services such as tugs for port movements, harbour refuelling, transport services between ships, stores and personnel transfer and aviation training.

The program is initially valued at $8 million annually over the next five years but is expected to increase over time as further services across Defence, and potentially other government agencies, are considered for inclusion.

It is expected that more than 80 jobs will be created across Australia in major ports and Defence establishments such as Sydney, Darwin, Cairns and Perth.

Minister Pyne said that this innovative approach will allow Australian defence industry to work together to develop creative contracting options to enable capability delivery at sea.

"This is about thinking beyond the square to deliver a long-term and flexible solution for Defence and industry."

"Instead of just contracting on large prime to deliver all the work, perhaps the best option is engaging multiple smaller companies."

"It will also provide assurance being given to smaller industry providers with value for money."

"We know from experience that contracts entered into now may not be fit-for-service in the future."

"One option I have been received, Defence will work with industry to develop a contracting model which ensures that support services remain up-to-date.

"This approach will shape a new way of doing business to ensure that marine support services are adaptive to evolving requirements."

The DMSS Program will commence in 2021 and will initially deliver marine support to Navy's fleet in ports across Australia, including sporting exercises, operations and workforce training.

HMAS *Hobart* (DDG 39), foreground, and the Arleigh Burke-class guided-missile destroyer USS *John Finn* (DDG 113), during cooperative engagement capability trials in September
(US Marine Corps photo)

Austal Delivers High-speed Catamaran to VS Grand Ferries

Austal has completed a 30 m high-speed aluminum catamaran for VS Grand Ferries of the Philippines. The Incat Crowther-designed vessel was built at Austal's shipyard in Balamban, Cebu. The new MV *Seacat* provides capacity for passengers at speeds up to 35 knots.

This $A5.5million contract was awarded to Austal in August 2017 with construction commencing in September 2017. The *Seacat* project met every milestone on time and on budget and is the first locally-operated vessel to be built to achieve Pioneer status, the prestigious elevated safety standard rating in the Philippines with the Maritime Industry Authority (MARINA).

"Austal Philippines has developed into an established and very successful shipyard which has produced high quality vessels for the world-wide market since 2012. Austal has been proud to be leading this sovereign industrial capability development for the Philippines", Austal CEO, David Singleton said.

"Our Philippines facilities employ more than 600 highly skilled local employees in a broad range of professional, technical and trade roles. Austal Philippines has been responsible for developing the local SME industry and supply chain whilst also collaborating with local universities and educational establishments to truly develop a sovereign industrial capability for the Philippines."

In the last two years Austal Philippines has delivered six high-speed commercial vessels at increasing rates of efficiency whilst maintaining Austal's standard for excellence. Austal Philippines is currently constructing modules for a 90 m next-generation high-speed catamaran for Fjord Line of Norway, the largest aluminium passenger ferry to be built in the Philippines. The vessel will be completed in a brand-new purpose-built 120 m long assembly facility which is Austal's largest outside of the USA. The new facilities are under construction and on track to be completed early 2019.

Austal Delivers LCS 18 to the US Navy

In September Austal USA delivered its ninth Independence-variant Littoral Combat Ship (LCS) to the US Navy. The future USS *Charleston* (LCS 18) is the third Austal-designed and built LCS delivered to the USN this year and she will be the fourteenth to enter the fleet.

The 30 m high-speed catamaran *Seacat* delivered to VS Grand Ferries of the Philippines by Austal
(Photo courtesy Austal)

"The Austal team is excited to deliver another of these incredible ships to the US Navy. We are very proud to be delivering this program with efficiency and reliability," Austal CEO,David Singleton said

"The maturity and success of the LCS program is a direct result of the dedication and skill of the Austal employees, and the technology invested in our Mobile, Alabama, next-generation shipbuilding facility."

"The automated production processes developed at Mobile is allowing us to roll out ships from the assembly bays one after the other in quick succession of ferrying a highly competitive advantage for Austal to be able to support the US Navy's fleet expansion to 355 ships," Mr Singleton said.

Five LCS remain under construction at Austal's Alabama shipyard *Cincinnati* (LCS 20) is preparing for sea trials. Assembly is underway on *Kansas City* (LCS 22) and *Oakland* (LCS 24) with modules under construction for *Mobile* (LCS 26) and *Santa Barbara* (LCS 28). The future USS *Canberra* (LCS 30) is in pre-production and will begin construction early 2019.

Austal is also under contract to build 2 Expeditionary Fast Transport vessels (EPF) for the US Navy. The company has delivered nine EPFs while an additional three are in various stages of construction

The future USS *Charleston* (LCS18) was delivered to the US Navy by Austal USA in September
(Photo courtesy Austal)

Austal USA Contracts for LCS 32 and 34

On 19 September Austal announced that it had been awarded construction contracts by the US Navy to build two additional Independence-class Littoral Combat Ships, the sixteenth and seventeenth ships in the class, at its Austal USA facility.

The specific value of each contract is under the congressional cost cap of US$ 555 million per ship (about A$ 760 billion for both vessels).

The 127 m LCS was originally designed in the Austal Centre for Excellence in Maritime Design based in Henderson Western Australia. The vessel design has been transferred to Austal USA and construction is undertaken in Austal's purpose-built shipyard in Mobile, Alabama.

"This latest order from the US Navy is a tremendous endorsement of the Austal LCS and further evidence of the importance which Austal plays in building the United States Navy", Austal CEO,David Singleton said

Austal continues to reduce cost and deliver on schedule, having delivered three LCS to the Navy this year, all under the congressional cost cap. Construction of LCS 32 is scheduled to begin in 2019 with delivery of LCS 34 expected to occur in mid fiscal year 2023.

Long Lead Order for Austal

It was announced on 19 October that Austal USA has been awarded a US$ 57 855 760 million order to fund the procurement of long-lead-time materials for the construction of a 103 m Expeditionary Fast Transport (EPF), the thirteenth vessel of this type ordered by the US Navy from Austal.

Long-lead-time materials for the additional vessel will include diesel engines,waterjets and reduction gears.

Austal was awarded the initial contract to design and build the first EPF in November 2008. The EPF is a high-speed shallow-draft catamaran, designed for rapid intra-theatre transport of troops and cargo. Reaching speeds of over 35 kn allows the EPF to be used for rapid deployment of conventional load special forces with their equipment and supplies.

Since 2008, nine Spearhead-class EPFs have been delivered and are serving as an affordable solution to fulfilling the Military Sealift Command's requirements worldwide. Three additional EPFs are under construction at Austal USA.

Austal Starts Work on 117 m Trimaran for Fred. Olsen

On 12 September Austal announced that construction had begun on the first of two 117 m high-speed passenger trimaran ferries for Fred Olsen Developed in Henderson Western Australia, at Austal's Centre of Excellence in Maritime Design, these technologically advanced, next-generation vessels will be used by Fred Olsen Express in the Canary Islands, joining their sister ship, *Benchijigua Express*.

Capable of transferring over 1000 passengers and 282 cars at speeds up to 38 kn the seven vessels will feature the latest in Austal's optimised hullform and vessel design and will be fitted with Austal's industry-leading ride-control technology.

"*Benchijigua Express* is the benchmark for blue-water commercial ferry operations, exceeding expectations for performance, speed and customer experience in the Canary Islands. This new vessel will be a game-changer in the international high speed ferry market and we are proud to be building it for Fred Olsen", Austal CEO, David Singleton, said

"The trimaran vessel's design provides advanced seakeeping whilst maintaining the carrying capacity of a catamaran This significantly Austal designed vessel provides a more comfortable ride for passengers while maintaining the carrying capacity of a traditional catamaran"

Ivan Fernandez Martinez, technical manager at Fred. Olsen said, "After the signing of the contract, the project spiral was

launched which, in several iterations, has improved the different details of the vessel, avoiding interferences and seeking appropriate solutions based on the current experience of years' operating in the Canary Islands. After these months of engineering, the metal-cutting ceremony symbolises the start of this exciting phase of production.

The contract with Fred. Olsen for the two 117 m trimarans is worth $190 million and was awarded to Austal in October 2017.

Austal Launches 109 m High-speed Ferry

On 2[illegible] October Austal launched the Auto Express 109 m high-speed vehicle/passenger ferry *Express 4* for Molslinjen of Denmark.

This launching at the Austal yard in Western Australia followed the roll out and joining of the hull and superstructure in August. The vessel is now undergoing final preparations to begin sea trials as part of the acceptance and handover process.

This next-generation catamaran commenced construction in April 2017 and remains on schedule to meet contract handover date in January 2019. *Express 4* features an advanced optimised hullform designed to minimise fuel consumption. Also built into the vessel is Austal's industry-leading ride-control system, which will result in superior seakeeping and comfort for over 1000 passengers travelling at speeds up to 40 knots.

"The technology and efficiency of this vessel truly places it in a class of its own — it has really redefined what is possible in high-speed aluminium vessel design", Austal CEO, David Singleton said.

"The international demand for Austal vessels in both commercial and defence markets is testament to the Austal team continually developing the world's most advanced vessel designs and then building them to the highest possible standards", he said.

"The commercial ferry market has further strengthened over the last 18 months, with the Austal Auto Express 109 setting the benchmark for large, technologically advanced, super-efficient, high-speed ferries", Austal Vice President of Sales and Marketing, Bent Marlander said.

"This is a record sales period for international high speed ferries and Austal is clearly leading the market with our highly differentiated and unique designs," he said.

Shipping the superstructure of *Express 4* after roll out
(Photo courtesy Austal)

Express 4 alongside after launching. Two Cape-class patrol boats and the first Pacific Patrol Boat *Ted Diro* are dwarfed by the large catamaran
(Photo courtesy Austal)

Austal Ferry for Trinidad and Tobago

Austal has commented on the announcement by the Prime Minister of Trinidad and Tobago in that country's press that the Trinidad and Tobago Cabinet has authorised the purchase of a fast ferry from Austal.

Until a contract is finalised, this initial announcement was expected to trigger the release of an advance payment which will allow design of the vessel to commence and for initial long lead time materials to be procured.

The vessel will be a 94 m high-speed catamaran for operation on the sea bridge between Trinidad and Tobago. The vessel is a variant of the two 109 m high-speed catamaran's currently in operation at Austal.

The 94 m catamaran to be designed and constructed by Austal for the Government of Trinidad and Tobago
(Image courtesy Austal)

HMAS *Brisbane* joins the Fleet

The Royal Australian Navy welcomed a new ship into the fleet on Saturday 27 October, with the commissioning of the guided missile destroyer, HMAS *Brisbane*.

In the ceremony at the Fleet Base East in Sydney, *Brisbane* officially became one of Her Majesty's Australian Ships.

Before an audience of dignitaries, family and friends, the Commander of the Australian Fleet, RADM Jonathan Mead AM RAN, welcomed *Brisbane* to the fleet.

During the ceremony the Governor-General of Australia inspected *Brisbane*'s crew and HMAS *Brisbane* received a blessing. The Australian White Ensign was hoisted, signifying completion of the commissioning. The crew marched onboard for the first time, where they cheered ship, as a mark of the ship.

The Prime Minister of Australia, the Hon Scott Morrison MP, and the Minister for Defence, the Hon. Christopher Pyne MP, attended the ceremony, and noted the importance of the occasion for both Australia's national security and domestic shipbuilding capability. The commissioning marks a major milestone in the life of the ship, and the Government's multi-billion dollar commitment to enhance the Navy's capabilities to protect our maritime interests.

The second of three Hobart-class guided-missile destroyers, *Brisbane* is the third ship to carry the name. Her Commanding Officer, CMDR Josh Wilson RAN, is proud to lead the ship's company as she joins the Australian Navy surface fleet.

"My crew and I are honoured to continue the name and proud history of *Brisbane* in the Royal Australian Navy, and excited to be given the opportunity to realise the incredible capabilities she represents," CMDR Wilson said.

Brisbane will now undergo her test and evaluation period where she will integrate into the fleet and Navy personnel will train to operate the warship.

The ship's company of HMAS *Brisbane* cheer ship during her commissioning ceremony
(RAN photograph)

HMAS *Brisbane* arriving in Sydney for the first time
(RAN photograph)

HMPNGS *Rabaul* Completes Final Voyage

Octob r mark d th ed 6 an era fo HMPNGS *Rbl* , which has completed her final voyage to Port Macquarie fm Lomb m Nax l Base n Mas Islad after 3 y ars 6 seriv ce with t he Pap New Gu n a Defe n e Fo ce.

The patrol boat was given to Papua New Guinea in May 1987 under the Pacific Patrol Boat Program, which ultimately delivered 22 vessels to Pacific Island nations.

Papua New Guinea received four Pacific Patrol Boats, which h v b en th b d o k 6 su cessflu Australia-Pap New Gu n a maritime secn ityc p ratif o v r 0y ars.

The Commanding Officer of the Pacific Patrol Boat handed the keys to the Commonwealth in Port Macquarie, to en b e ein rm eh ally resp ib e d sp al 6 th v ssel. Th crew will trav l to th Defe n e In era tia l Train g Centre and then to Western Australia for training before receiving the first of their four Guardian-class replacement v ssels in late Nov mb r 8 Th n w p trb b t will b named after Brig d er Gen ral Ted Diro (retired) , th first Commander of the Papua New Guinea Defence Force.

The replacement vessels are being delivered under the Pacific Maritime Security Program, which builds upon the success of the Pacific Patrol Boat Program and continues Australia's enduring security commitment to the South Pacific.

Ud r th Prg am, Aus tralia will g v 9 Gu rd an-class patrol boats to 12 Pacific Island nations. The program also includes a region-wide aerial maritime surveillance capability, enhancements to regional coordination, ss taim eh ad train g sp t, ad th co in a tio 6 Australia's in-country maritime adviser network. Timor-Leste will also r eceiv twoG u rd an-class v ssels.

The new Guardian-class patrol boats, being built in Western Australia by Austal, will offer enhanced capability to broaden and strengthen the region's maritime security, fisheries protection and response to transnational crime.

The Papua New Guinea Pacific Patrol Boat, HMPNGS *Rabaul*, arrives at her last berth
(RAN photograph)

RNZN Acquiring Norwegian OSV

The New Zealand government has approved $NZ103 million for the purchase and refit of a second-hand multi-rb e 6 fsh e sp p t v ssel wh ch will b s ed as a id v and hydrographic support vessel by the Royal New Zealand Nay .

Following purchase, the 85 m Norwegian-built survey v ssel MV *Edda Fn* will be outfitted with the dive and hy g aph c sy tems req red t h d fen e fo ce.

MV *Edda Fonn* will replace the hydrographic ship HMNZS *Resb utin* ad th id v sp t sh p HMNZS *Ma w ai* . Th two v ssels were d com missio d fm th RNZN in 0 ad 8 resp ctiv ly, fo lw ig sev ral d cad s 6 serv ce.

"Th s v ssel will en u e th t th cu ren cap b lity g p fo diving and hydrography are filled as quickly as possible, with a p v n well-tested p atform," said th Min ster 6 Defe n e, R dM ark

Th sh p is sch d ed to b d liv red to Dep t Nax l Base in May 9 It will featu e a 0 t salw g cran , a remotely-operated vehicle and a contemporary dynamic positioning system, which will allow Navy's specialist d v rs to ach ev g eater lev ls 6 effectiv n ss ad safety, im g eater rag 6 cid tin .

Th Ry l New Zealad Nay was in tially sch du ed to receiv a cs tm n w-b ld v ssel, b an $N Z8 millio cs t b w n in th cu ry's frig te g ad p j ect fo ced th g rm en to c n id r a s ed v ssel.

Defence officials identified *Edda Fonn*, owned and operated by Norwegian company Østensjø Rederi, as the most su tab e p in fm an in tial list 6 v r 0 cad d te 6 fsh e ads h ea sp t v ssels.

"Defence officials have subjected *Edda Fonn* to considerable scrutiny ahead of purchase," said Ron Mark. "We have b en assu ed by id p d n ep rts th t it is in ex ellen condition, and will handle well in the operations the Defence Fo ce will u e it fo ," h said

Th v ssel g n rally p rates in th No th Sea, ad is d r lease until the end of 2018, following which the modification p o ess will b g n

Once delivered, final modifications will be undertaken in New Zealad It is ep cted th t New Zealad id try will b ik v d in th s p rt 6 th p j ect. The sh p is ep cted tob in s eriv ce with t h Nay N v mb r 9

Edda Fonn
(Photo courtesy RNZN)

Red Jet 7 from One2three NavalArchitects

Red Funnels' *Red Jet 7* was built in East Cowes, UK, by Wight Shipyard and represents a £7 million (AU$12.6 million) in stmen in its Sth h mp W est Cw es r u e. Lik h r near-sisters, *Red Jet 7* uses waterjets rather than propellers to

Red Je t 7
(Photo courtesy Justin Merrigan)

aid manoeuvrability and provide impressive stopping power. An advanced hull design and computer-controlled interceptors also help keep the wash to an absolute minimum, wh ch i s gh ws fo n arby eisn e craft.

The One2three-designed vessel is fitted with four MTU 10V 0 M72 main eg n s pw erig q d Hamilto HM37 waterjet n ts co cted v a ZF 0 g arb s.

This configuration was chosen to ensure high levels of in-service availability as she can operate on two or three engines if ay waterjet in akes b cm e ob tru ted y d b is in th Sb en . Eh s t emissi fu ly cm p y with th IMO Tier II reg ati .

Other technical innovations to help reduce fuel consumption include the use of specialist marine-grade vinyl instead of paint for the superstructure to reduce weight, and the application of the latest Teflon hull coatings to minimise d ag th g th water. Su h tech g h lp d *Red Jet 7* ach e a tp sp ed 6 9 k n trials, wh ch is in excess 6 h r req red n serv ce sp ed 6 8 k

In era lly, *Red Jet 7* 6 fers a p emim ep rien e with comfortable high-back leather seats with cup-holders, space fo fo wh elch irs ad amp e amo s 6 lg g . USB charging points for phones and tablets have been fitted to all window seats. In common with the rest of the fleet, free wi-fi is available, offering customers a fast and stable ship-to sh e co ctio

LED lighting is provided throughout and the cabin air temperature and humidity are controlled automatically th k to a sp sticated air-h d ig sy tem wh ch p s a stp to in era l cd en atio o th wid s, all 6 wh ch are tin ed op e n g are.

Six LED HD TV screens offer a wealth of information in real time, in ld g lo al ad a tio l n ws head in s, th latest weath r ad Ji travel co ctio fo b es, co ch s ad trains. The screens also show the vessel's GPS position along th rt e ad can d sp ay a liv v d o feed frm ex era l cameras facig o ward h ft.

Prin ip l p rticl ars 6 *RedJ et7* are

Leg h O A	4 m
Leg h WL	9 m
Beam mb d d	m
Draft	0 m
Crew	4
Passeg rs	+ 2 w h elch irs
Fu l o l	L
Freshw ater	L
Lb o l	L
Sl lag	L
Oily b lg	L
Main e g n s	4×MTU 0 V 0 M 2 each k W @ r m
Gearb s	4×ZF 0
Pr p sion	4×Hamilton H M3 w aterjets
Gen rato s	2× k W 4 V 3 p se 6 H z
Trim Co rb	Hm p ee in ercep o s
Serv ce sp ed	k @ % MCR
Rag	0 m iles @ k

Acadia Explorer and *Schoodic Explorer* from Incat Crowther

Incat Crowther has announced the delivery of a pair of mu ti-fu tio 1 2 m catamaran p sseg er v ssels, *Acdi a Exp o er* ad *S hdi c Exp o er*. Bu lt to a h g stand rd y Gu f Craft in Frak in Lo siana , fo Bar Harb Wh le Watch Co., the USCG Subchapter T-certified vessels will b s ed fo wh le-watch g ex u sio , a tn e cru ses ad lighthouse tours in the Acadia National Park and surrounding areas, as well fo p v d g ted er serv ces to cru se sh p wh ch freq n p ctu es q Bar Harb , Main , d ig th sp ig d m mer mt h .

Th p actical v ssels featu e th ee b rd g areas o each side of the vessel to facilitate efficient loading and unloading, and a pair of stairs leading to the upper deck enhances passenger flow.

Th ADA-cm p iat main d ck cab n h s seatig fo 14 p sseg rs in a climate-co rb led in erio . In ad tio th forward doors provide access to the exterior foredeck seating fo 6 p sseg rs. Th cm fo t 6 p sseg rs is ad essed with ergonomic seating fitted with tables, a large kiosk serving various snacks and refreshments, and five televisions for entertainment. The aft end of the accommodation in ld s twd ad ,o 6 wh ch i s ADA cm p iat .

Th p r d ck p v d s a sp cio ad p n v ew 6 th

environment with seating for 65 passengers, with 36 of these d r co v r. En ertaim en is priv d d by a larg -screen cen relin teleiv sin

Th larg wh elhs e is eq p d with wig statin ad th latest electro ics fo safe a iv g tin

The roof above the wheelhouse is fitted with a station for a n tn alist wh is task d with d ssemina tig ifi o matio to p sseg rs ab lad ark ad wild ife wh ch are with n iewigd stan e.

Propulsion is provided by two Caterpillar C32 ACERT eig n s rated at 9 kW @ 0 rpm d iv g two Hamilto HM3 waterjets fo a serv ce sp ed 6 25 k Rid cn rb fo p sseg r ride comfo t is p iv d d by a com p emen 6 Hm p e in erce p ors. Electrical p v er is p iv d d by a p ir 6 Caterp llar C4g n ratigs ets.

Principal particulars of *Acadia Explorer* and *Schoodic Exp o er* are

Leg hO A	0m
Leg h WL	2 m
Beam OA	6m
Draft (h l)	0m
Dep h	0m
Passeg rs	0
Crew	4
Fu l o l	6L
Freshw ater	5L
Slu lag	5L
Main e ig n s	2 Caterp llar C2 ACERT eachk W @ 0r pm
Prp sio	2 HamiltoH M3w aterjets
Gen rato s	2 Caterp llar C4 eachk kW
Sp ed (serv ce)	2 k
(max mm)	0k
Co tru tio	Marin -g ad alm in m
Flag	USA
Class/Su v y	USCG Sb h p er T

Aa dian Exp lorer
(Photo courtesy Incat Crowther)

20 m Workboat from Incat Crowther

Incat Crowther has announced a design contract with Cape Town-based shipbuilder Veecraft Marine for the sp y 6 a 0 m mb l wo ha t fo th Su h African National Defence Force. The vessel will be tasked with th tras p tatio 6 p rso l ad eq pm en ad sp t training activities in coastal areas up to 10 n miles off

Starboard bow of 20 m workboat for South African National Defence Force
(Image courtesy Incat Crowther)

the coast under the inclement weather conditions often experienced in the area. The vessel is designed in accordance with BV requirements and in compliance with flag-state rules as defined by South African Maritime Authority (SAMSA) fo Categ yC v ssels.

The main deck features a forward deckhouse with wh elhs e ab ad a g n rs 2 m^2 aft cargo d ck The modestly-sized deckhouse is fitted with galley and mess areas along with two bathrooms and a deck locker accessible from th carg d ck Th wh elhs e is arrag d fo 6 ° visibility, including an unobstructed view of the cargo deck.

The cargo deck of the aluminum vessel is able to accommodate a 6 m ISO container and is also fitted with a 5 t marine crane. A foldable dive platform is fitted aft of the tras m , alg with stairs in eg ated in o th main d ck to p iv d safe access.

Belw d ck in ld s two 3 m^3 carg h ds with access hatches above, engine room, fuel and water tanks, and a crew accm md tio sp ce. Th crew accm md tio featn es th ee staterm s, each with th ee ba fo a to al cap city 6 in n crew memb rs.

Other notable features include a robust fendering system and h ayt w igb lard ne ache d6 th v ssel.

With a modest service speed of 16 kn at a healthy deadweight load of 20 t, the vessel will be powered by two MAN D2862 LE4 marin eig n s rated, each at 5 kW @ 8 0 rpm driving Teignbridge fixed-pitch propellers through ZF 2050 g arb s.

Port quarter of 20 m workboat for South African National Defence Force
(Image courtesy Incat Crowther)

The vessel will be the sixteenth Incat Crowther vessel built by Veecraft in less than a decade, and further demonstrates the versatility of both organisations in delivering custom solutions tailored to unique and demanding requirements.

Principal particulars of the new vessel are

Length OA	[illegible] m
Length WL	[illegible] m
Beam OA	[illegible] m
Depth	[illegible] m
Draft (hull)	[illegible] m
(propellers)	[illegible] m
Passengers	[illegible]
Crew	4
Fuel oil	[illegible] L
Fresh water	[illegible] L
Sullage	[illegible] L
Main engines	2×MAN D[illegible]LE[illegible] each [illegible] kW @ [illegible] rpm
Propulsion	2×fixed-pitch propellers
Generators	1×Kohler [illegible] kVA @ [illegible] rpm
Speed (service)	[illegible] kn
(maximum)	[illegible] kn
Construction	Marine-grade aluminium
Flag	South Africa
Class/Survey	BV/SAMSA

Jiang Men from Incat Crowther

Incat Crowther has announced the launch of the 40 m catamaran passenger ferry, *Jiang Men*, built by Wang Tak. *Jiang Men* is the third in a series which started with *Bai Zi Yang 7* in [illegible]. In the constantly evolving, highly competitive Chinese marketplace, Incat Crowther has continued to improve the design, realising an [illegible]% reduction in fuel burn. The vessel is engineered for robust structure and performance.

Jiang Men accommodates 199 passengers with 162 economy class passengers seated on the main deck and 37 business-class and VIP passengers seated on the upper deck.

A large crew area is located at the aft end of the main deck including sleeping quarters, mess room and pantry. Forward of this are stairs to the business-class cabin, three toilets, luggage racks and a kiosk. The economy seats on this deck are arranged in a 2-3-3-2 layout which affords excellent access and wide aisles.

The upper deck consists of [illegible] comfortable business-class seats at a relaxed pitch with wide aisles. Two VIP rooms are located aft, in addition to an oversize bathroom. The aft upper deck features a dedicated area for luggage containers to be lifted onboard and secured on the deck.

Jiang Men is powered by a pair of MTU [illegible] M72 main engines, each delivering [illegible] kW at [illegible] rpm. She is propelled by MJP [illegible] CSU waterjets for a top speed of [illegible] kn.

The vessel's operational efficiency is mirrored by its maintenance simplicity, with design features such as clear overhead removal paths for the main engines and large switchboard utility spaces adjacent to the engine rooms.

The vessel meets CCS's latest rules for sea-going high-speed craft.

Jiang Men's improved efficiency heads the class and cements Incat Crowther's premier standing in the market, leading the way in the competitive Pearl River Delta market.

Principal particulars of *Jiang Men* are

Length OA	[illegible] m
Length WL	[illegible] m
Beam OA	[illegible] m
Depth	[illegible] m
Draft (hull)	[illegible] m
Passengers	[illegible]
Crew	11
Fuel oil	[illegible] L
Fresh water	[illegible] L
Sullage	[illegible] L
Main engines	2×MTU [illegible]V [illegible]M7[illegible] each [illegible] kW @ [illegible] rpm
Propulsion	2×MJP [illegible]CSU waterjets
Generators	2×Cat C4[illegible]
Speed (service)	[illegible] kn
(maximum)	[illegible] kn
Construction	Marine-grade aluminium
Flag	China
Class/Survey	CCS CSA Catamaran HSC, Passenger A, Coastal Service Restriction Pearl River Area – Hong Kong and Macao

Port bow of *Jiang Men*
(Image courtesy Incat Crowther)

Xin Hai Bin from Incat Crowther

Incat Crowther has announced the launch of *Xin Hai Bin*, a [illegible] m catamaran passenger ferry built by Afai for Zhuhai Fast Ferry Company. Incat Crowther's relationship with Afai dates back to 1982, when the yard built the first Incat Crowther ferries to enter service in China. In [illegible], *Xin Hai Bin* is the 50th Incat Crowther-designed vessel for operation in China.

Xin Hai Bin is based on the proven and unique Incat Crowther Z-bow hull form used on *Hai Ju* and *Hai Ya* in [illegible]. The hull was lengthened and a new modernised superstructure built on this platform, with two passenger decks and a raised wheelhouse. The modular approach collaboratively developed between the yard and the designer, gives Afai a competitive advantage in both cost and delivery.

Passengers board via aft gates and enter the main deck cabin. This deck seats [illegible] economy class passengers along with bathrooms, luggage racks, pantry, service counter and crew room.

Port side of *Xin Hai Bin*
(Image courtesy Incat Crowther)

Central stairs lead to the upper deck, with seats for 59 business-class passengers and 12 VIP passengers, as well as a dedicated service counter.

Xin Hai Bin is powered by a pair of MTU [illegible] main engines, each delivering 1050 kW and driving fixed-pitch propellers. The vessel's Z-bow hull form exhibits excellent characteristics in rough water, whilst giving the vessel class-leading efficiency.

Xin Hai Bin is a sound demonstration of the strong relationship between Incat Crowther and Afai, and the value which such a relationship brings to the Chinese market.

Principal particulars of *Xin Hai Bin* are

Length OA		[illegible] m
Length WL		[illegible] m
Beam OA		[illegible] m
Depth		[illegible] m
Draft	(hull)	[illegible] m
	(propellers)	[illegible] m
Passengers		[illegible]
Crew		9
Fuel oil		[illegible] L
Freshwater		[illegible] L
Sullage		[illegible] L
Main engines		2×MTU [illegible] each [illegible] kW @ [illegible] rpm
Propulsion		2×fixed-pitch propellers
Speed	(service)	3[illegible] kn
	(maximum)	[illegible] kn
Construction		Marine-grade aluminium
Flag		China
Class/Survey		CCS CSA Catamaran HSC, Passenger A, Coastal Service Restriction

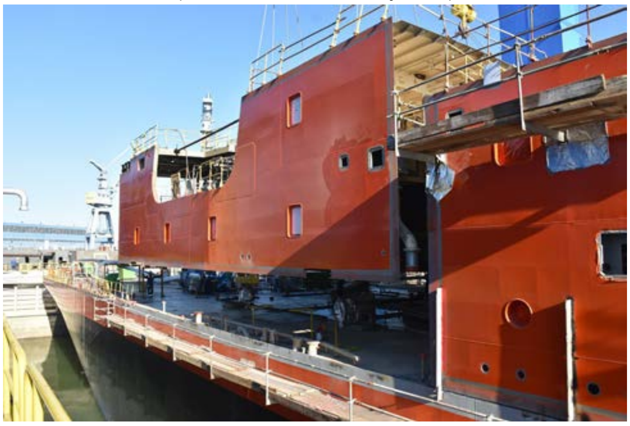
Stewart Muller

Progress on Australia's New Icebreaker

The Australian Antarctic Division reports that, since RSV *Nuyina* was moved to a wet dock in late September, construction of the superstructure (area above the watertight hull) and internal fit-out has progressed rapidly.

Some of the expedition and crew spaces are now being fitted out, with ensuites installed in cabins, while the galley and dining area, and a theatre with raked seating and a raised stage, are under construction.

RSV *Nuyina* floating in the dry dock before being moved to a wet berth in September
(Photo Damen courtesy AAD)



A superstructure block being erected
(Photo Michiel Jordaan courtesy AAD)

On the science front, the CTD (conductivity, temperature and depth) hangar, which includes a moon pool, is taking shape. The CTD equipment will be deployed from the ship through the moon pool or with an overhead crane through a door in the side of the ship. The CTD is a critical piece of scientific equipment used to measure ocean salinity (conductivity) and temperature at different depths.

The moon pool is a [illegible] m vertical shaft, 4 m square, which runs through the ship's hull to the open ocean. When its top and bottom hatches are opened, the moon pool will allow the deployment of CTDs, nets, underwater vehicles and other oceanographic instruments, from within the relative comfort and protection of the ship.

The CTD hangar, which includes a moon pool (at right)
(Photo Michiel Jordaan courtesy AAD)

Sea-ice scientists will be able to deploy onto the sea ice via a specially designed ramp. The scientists will also have access to an adjacent cargo hold area to store their equipment and mobile laboratories (in modules similar to shipping containers), when the area is not in use for resupply.

The scientific winch room on deck three (below the level of the aft science deck) is also being kitted out with six main

Expeditioner and crew cabins will have ensuites with shower, toilet and basin, shown here with green protective covers being installed on Deck 6, below the helicopter hangar
(Photo Michiel Jordaan courtesy AAD)

The ship's aft science deck (Deck 4) with the starboard aft mooring station in the foreground
(Photo Michiel Jordaan courtesy AAD)

One of two switchboards which will take power from the ship's four diesel generators and two shaft-driven electric-motor generators
(Photo Michiel Jordaan courtesy AAD)

win h s — two trawl win h s, o d ep sea co er win h o d ep sea tw ing win h with electro-p ical capab lity fo co ctig cameras ad to h r pw ered eiq m en , a tw ed yd win h ad a g o ral-p p e win h with dynex fibre rope. These winches collectively have over 0k 6 cab e leg hs p edt h ir sto ag d m s.

On th p ratio l sid , th switch o rs h v b en is talled Th se will tak pw er fro th sh p s fo d esel g o rato s ad two sh ft-d iv n electric-mo o g o rato s ad reid rect it to ru all th electrical com p n s o th sh p in id g com p ers, lig s ad lab ato y eiq m en .

In th eig o ro s, is u latio cab es ad p p wo k are b ig is talled Th fo ward mo ig d ck is also b ig fitted out with windlasses (anchor winches) and bollards.

In th d y d k a rag 6 sp rstru tu e b o k is cu ren ly b ig assemb ed, in lid g th h licp er h g r ad th b ig with its 3 m b am. Th se will b ad d to th sh p b fo e sh o k tu s int h wet d ki N v mb r.

wwwt a cticg u

This forward cargo hold area will house up to 48 20-foot shipping containers over three decks
(Photo Michiel Jordaan courtesy AAD)

The navigation bridge, crow's nest and main mast taking shape in the dry dock, with the windows for the crows nest already installed. The bridge wings either side span about 32 m
(Photo Michiel Jordaan courtesy AAD)

Cruising in NSW

Th win er iq et saw *Carnival Spirit, Pacific Eden, Pacific Explorer, Pacific Jewel, Sea Princess,* and *Sun Princess,* working out of Sydney, the increasing number of six vessels (p fro two a cp le 6 y ars ag b ig id cati v 6 th in reasig d mad f o with er cru ses.

Th arriv l 6 *Maj estic Prin ess* o 5 Sep emb r sig lled th start 6 th o k sm mer seaso Sh was fo lw ed by *Rdi a e f the S s , Ca in val Leg d, Celeb ity S stice, Golden Princess, Noordam,* and *Explorer of the Seas* in Octb r.

November moved into a higher gear, with many return visits by th se v ssels p s *Ova if t hes s* .

Vessels berthing regularly at the Overseas Passenger Termin l at Circu ar Qu y is a sn e sig th t th sm mer cru se seaso is d r way.

PhilH elmo e

Trials for *Spirit of Australia 2*

Martin Grimm

The weekend of 1–2 September was an opportunity for David Warby and his team to test *Spirit of Australia 2* (or *Spirit2* for short) on Blowering Reservoir, in the NSW.

The intention of the team is to exceed the current world water-speed record of 317 mph (511 km/h or 276 kn) currently held by David's father, Ken Warby, in *Spirit of Australia* set on Blowering Reservoir on 8 October 1978 just over 40 years ago.

David completed a series of runs on Saturday morning 1 September and again in the afternoon reportedly achieving 206 mph (331 km/h or 179 kn) that day. On Sunday morning, after a delay while awaiting wake from a speed boat to dissipate, further trial runs were performed with the boat achieving 218 mph (351 km/h or 189 kn). However, on both days, David experienced steering issues and on lifting the boat from the water following the Sunday morning runs, it was discovered that stainless steel backing plates, which are used as part of the attachment of a pair of fins to keel strakes on the boat, had been broken by the dynamic pressure of the water acting on their leading edges. As it wasn't possible to repair or replace these plates at short notice, a decision was made to end further trials for the weekend.

The speed achieved on 2 September, while not official and/or a two way average, still exceeded Ken Warby's initial record from 1978 (when he had achieved 214.8 mph) as he too progressively increased his speed. The Warby team are quite intentionally making incremental advances while monitoring the performance of the boat.

Observing a watercraft travelling at this speed is quite remarkable and the sound of the jet engine winding up and then changing cross the reservoir raised totally new experiences.

At this stage, further trials are proposed for the weekend of 1–2 December 2018 with NSW Roads and Maritime Services declaring an exclusion zone daily for these trials. Aside from replacing the fin backing plates with a stronger set, cockpit modifications have been made and steering control is being revised with a new profile rudder also being fitted.

A damaged fin backing plate marks the end of trials in September
(Photo Martin Grimm)

Underside of *Spirit of Australia 2* being lifted from water showing fins forward
(Photo Martin Grimm)

Spirit 2 shows a clear pedigree from the original *Spirit of Australia*. However a key difference is the powerplant. Whereas *Spirit of Australia* was fitted with a Westinghouse J34-WE-34 turbojet with 3400 lbs (15.12 kN, 1542 kg) static thrust, *Spirit 2* is equipped with a Rolls Royce/Bristol Siddeley Orpheus 803 turbojet of 5000 lbs (22.24 kN, 8 kg static thrust. For his original record bid, Ken had purchased three of the J-34 at an RAAF surplus auction. They had been used in pairs on the RAAF Lockheed P2V-7 (later SP-2H) Neptune maritime-patrol aircraft to augment thrust from its radial engines during take-off. David's Orpheus 803 has been removed from an ex-Italian Air Force Fiat (later Aeritalia) G.91 jet fighter. With around 50% more thrust available, and assuming at these high speeds that resistance varies approximately with the square of speed, this suggests a speed of around 8 mph (0 kn/h or 9 h might technically be possible; however, the team has a target speed of 4 8 mph (6 kn/h which if achieved would push the craft over the 300 kn mark. As a comparison, the G.91 fighter in which the Orpheus 803 was installed had a maximum speed at sea level of 6 6m h(fkn /h.

Externally, the main visual difference is that *Spirit of Australia* was fitted with a combined vertical and horizontal "T" stabiliser aft, while *Spirit 2* is only fitted with a vertical stabiliser. However *Spirit 2* has small spoilers on the upper rear fuselage either side of the stabiliser. The composite construction of *Spirit 2* is also more robust than its predecessor, consistent with the stringent safety rules now in place.

The hydrofoil craft appears very similar to *Spirit of Australia* as is apparent when comparing photos of both craft.

The team and its considerable support network from groups such as the local SES and VRA along with NSW RMS, based their operations from The Pines campground on the eastern shore of Blowering Reservoir just off the Snowy Mountains Highway a few hundred metres to the west of Talbingo.

The boat is lifted in and out of the water using a mobile crane. Periods between racing the reforoe afford a good opportunity to take a closer look at the boat. A visit to Blowering to witness the trials is well worthwhile.

Spirit of Australia 2 stern quarter while being lowered onto its trailer
(Photo Martin Grimm)

Underside view of *Spirit of Australia 2* being lifted into the water
(Photo Martin Grimm)

Underside of *Spirit of Australia* at the Australian National Maritime Museum showing some of the heritage of *Spirit 2*
(Photo Martin Grimm)

An overall view of *Spirit of Australia* on display at the Australian National Maritime Museum
(Photo Martin Grimm)

Should Nuclear-powered Submarines be part of Australia's Future?

Peter Briggs

Australia's rapidly deteriorating strategic circumstances have caused me to review my earlier stance on the navy's future submarine requirements and the case for nuclear propulsion.

As Hugh White wrote in response to Paul Dibb and Richard Brabin-Smith's 2017 paper on strategic risk in a new era:

If we decide that Australia should be able independently to resist a direct attack from a major Asian power like China, then we need to start building the forces to do that right now, without waiting for some further warning sign.

The time has come for early consideration of all aspects of a transition to nuclear propulsion for Australia's submarines based on compelling strategic and submarine capability arguments.

While acknowledging the strategic and operational advantages that a nuclear-powered submarine force would provide, it must be recognised that there would be some formidable challenges to overcome to add such a force to the RAN.

Quite apart from the political sensitivity of such a decision, it would be a protracted process requiring a lead time of 15 to 20 years, driven largely by the technical, training and educational preparations and a very significant increase in qualified personnel required to operate and maintain the force.

The current program to acquire 12 conventional future submarines (FSMs) is an essential starting point for a successful transition which will take significant time and a national focus to achieve. The RAN must first achieve the critical mass of submarine personnel and be able to sustain the manpower required for this challenging transition.

Attempting a transition before the Australian submarine arm has achieved sufficient size in platforms and personnel risks a capability gap even if there are no delays during the transition.

In the face of a deteriorating strategic outlook, the consequent need to transition to nuclear submarines (SSNs) expeditiously and the reality that growth of the submarine arm via FSM is essential to starting that transition, that program must be accelerated, with a national priority allocated for funds, personnel and a fast track for facilities.

A force of modern SSNs offers significant sea-denial and force-projection capabilities, providing at least twice the number of more capable submarines deployed at long range compared with an equivalent number of conventional submarines, assuring the ability to sustain a high level of deterrence and operational capability. A fleet of 12 double-crewed SSNs would allow four submarines to be on task at long range and constitute a formidable deterrent force. Such a fleet would also facilitate a rolling construction program.

A force of at least ten nuclear submarines with ten crews is the minimum required to maintain a critical mass of trained personnel and to generate the experience needed to crew the senior supervisory and policy staff needed for a globally credible nuclear-safety organisation.

A force of at least 12 conventional future submarines, each with a crew of at least 60 and a total submarine arm of at least 2,000 is judged to be a conservative, safe and viable starting point for a transition to a force of ten SSNs.

The options for Australia to develop an SSN capability would be limited to building the boats offshore or to consolidating the vessels in Australia incorporating a reactor purchased offshore. Leasing SSNs is not a practical option.

A supporting nuclear power industry is desirable as it would provide Australia with a broader regulatory, technical and educational base. However, provided that the costs of not having that support are clearly identified, the absence of an Australian nuclear-power industry should not preclude a transition to nuclear propulsion for Australia's submarines.

The timing of any transition should be one of the study's findings. Two time-lines may serve to illustrate the long lead times required:

- The initiation of a training program to prepare the policymakers and senior technical management personnel will be necessary six to eight years prior to ordering the first SSN.
- Over 250 experienced RAN submariners (approximately 12% of the submarine arm operating 12 FSMs) would then enter nuclear education and training pipelines approximately eight years prior to the commissioning of the first SSN.

Given the lead time, unfolding strategic situation and benefits of nuclear propulsion, an immediate decision is recommended to commit to a feasibility study into a transition to nuclear propulsion to be delivered by 2020. It's time we understood the benefits, costs, risk and timescales of this option fully.

Finally, a reminder for cabinet's national security committee. We need to accelerate the FSM project, with national priority for resources without reducing the sovereignty of our own subs. It would also be a good idea to stock up on the high-tech costly long-lead-time weapons to go in these torpedo tubes.

Will someone heed the warning bells?

Author

RADM Peter Briggs AO CSC RAN (Rtd) is a retired submariner and a past president of the Submarine Institute of Australia.

First published by The Australian Strategic Policy Institute (ASPI) at www.aspistrategist.org.au. The ASPI Special Report SR129, Can Australia afford Nuclear Propelled Submarines? Can we afford not to? *by Peter Briggs was published in October 2018 and is available from www.aspi.org.au.*

Sailing Catamaran Performance Metrics

Kim Klak

Intrd uctin

Cru sig sailig catamaran are o th h g sp ed easy cap ize racig fo lers wh ch cap u e th sailig p ic's attention Th y are relatie ly h ay , sed te ad stab e lie -ab rd p atfo ms. Th y are io reasig y p ar in th y ch -charter market. In terms of design there are two main variants: those with retractable dagger boards and those with fixed stub k els. Th ir cru sig rb e o with taid g p rfo man e is still an imp tan attrib e, ad th s u l p imisitic claims p ay an imp tant p rt in th ir mark tig Hw can th ae rag sailo cu th g th sales sp n ad assess th relatie p rfo man e 6 d fferet md ls?

Here a set of five metrics is proposed for assessing the relative performance of cruising sailing catamarans, by using just six p ish d d sig c h racteristics.

It is with some trepidation that this proposal is submitted: whilst it attempts to provide something useful, it also flies in the face 6 g scien e o eg n erig Almo t sin e the b g n g 6 o p 6 essio a a l arch tects h e tried to d scrib the complex shape of a vessel by reducing it to a few simple parameters — length, displacement, block coefficient, and the like. We have also attempted the same with performance — resistance coefficient, Froude number, advance coefficient, etc. Sm etimes th se effo ts are d rp o d b sd an ly ical p o esses su h as d mes io l an ly is; at o h r times they are driven by pragmatism. The approach described here most definitely sits in the latter camp.

Nomenclature

A	profile area (m^2)
A_b	profile area of dagger board (m^2)
AR_e	effectie asp ct ratio
A_s	area of stk el (m^2)
B_{OA}	b am o rall (m)
B_{WL}	waterlie b am 6 o h l (m)
C_L	lift coefficient
	lift cu e slp (/1 rad)
e	o d mes io l lift
e_b	o dimes io l lift 6 d g r b rd
e_s	o dimes io l lift 6 stk el
Fn	Frd m b r
g	acceleratio tg av ty(m/s^2)
g o im	g m etrically imilar sh p s 6 d fferet sizes
GZ	rig ig rm (m)
h	h elig e r (from VCB to VCE) (m)
$k k'$	arb trary o tat s,s m etimes d mes ib ess
L	lift (sid fo ce) (N)
L_b	lift 6 d g r b rd(N)
L_s	lift 6 stk el (N)
L_{OA}	leg h o rall (m)
L_{WL}	leg hw aterlie (m)
R_{low}	resistan e at lw sp ed(lw Frd m b r) (N)
R_{high}	resistan e at h g p ed(h gF rd m b r) (N)
RM	rig ig m m et (Nm)
SA	sail area (m^2)
T	d aft (m)
T_h	d aft 6 h l ex ld g d g r b rd (m)
V	b t sp ed(m/s)
VCB	e rtical cet re 6 b o y(m)
VCE	e rtical cet re 6 effo t 6 sails (m)
VCG	e rtical cet re 6 g av ty(m)
V_{ld}	d nwid ig airs sp edm etric
V_{hd}	d nwidf reslb eeze sp edm etric
V_{lu}	p ind ig airs sp edm etric
V_{hu}	p indf reslb eeze sp edm etric
WSA	wetted u face area (m^2)
α	leeway g e (rad)
Δ	mass d sp acemet (kg)
ρ	d n ity6 water (kg m^3)

Assumptions

In o d r to mak th s issu tractab e, a nm b r 6 assumptions h e b em ad :

1. R ig are g o ims,s o $VCE = k\sqrt{SA}$
2. Oe rh g eg h are small ad imilar, so $L_{WL} = k \times L_{OA}$.
3. Hulls are approximately semi-circular in section d rwater, so $B_{WL} = 2 T_h$. Th s eq tio is o u ed d rectly it merely sp ts th ap o matio th t $WSA = k \times T_h \times L_{OA}$.
4. At lw Frd m b r, frictio d in tes d ag so $R_{low} = k \times WSA$.
5. At high Froude number, wavemaking dominates drag, so $R_{high} = k \times \Delta$.
6. With wind forward of the beam, the sailing efficiency is governed by the underwater shape rather than th rig (mo t cru sig cats h e mu h lw er y d odynamic efficiency than aerodynamic efficiency) (Palmer, 0 .
7. We h y h e to co id r o h l fo lift, d ag, etc. p o d d h t it is d co istet ly.
8. In the absence of a published chord length for a d g r b rd it is assm ed to b h lf th sp n of th b rd
9. Lg td a l stab lity is o tak n it o acco t; in p actice th s 6 ten sets an p r limit o d w id b t sp ed m freslb eeze.

Equat io s

Fundamental Relationship

The full velocity prediction process is simplified as

speed = f(stability, sail area, hull drag, foil efficiency)

Fo cm p riso 6 b ts 6 d fferet sizes, d mes ib ess m b rs sh d b u ed fo each 6 th ab facto s, with sp edb ig d mes io lised ig F rd m ber:

$$F_n = \frac{V}{\sqrt{g \times L_{OA}}}$$

Strictly speaking, waterline length should be used in this equation. However, for design aims, it is acceptable to use the more-often-published overall length.

The aim is to estimate comparative speed, i.e. speed of one boat compared with speed of another, regardless of any size difference. Therefore, once a dimensionless performance factor has been established, Froude's law of comparison can be used to obtain a measure for absolute speed.

Power to Carry Sail (Tippiness Factor)

We shall only concern ourselves here with small-angle transverse stability. Small-angle stability of a catamaran is easy to formulate because the centre of buoyancy shifts from the centreline to the outer hull as soon as the windward hull starts to lift. Furthermore, the VCG of a catamaran has very little influence on small-angle stability because the righting arm is so large. Also, the width of the hulls is small compared to the overall beam. Provided that the analysis is limited to similar types of catamaran, it can be assumed that the righting lever GZ is linearly proportional to the overall beam:

$$GZ = k \times B_{OA}$$

and the righting moment becomes

$$RM = k \times \Delta \times B_{OA}$$

The heeling moment from the rig is the product of the sail force and the lever arm:

$$HM = k \times h \times SA$$

As a first approximation,

$$h = k\sqrt{SA}$$

so the heeling moment becomes

$$HM = k \times k\sqrt{SA} \times SA = k' SA^{1.5}$$

The effort required to lift a hull (the "tippiness") is linearly proportional to the ratio of heeling moment to righting moment, i.e.

$$Tippiness\ metric = \frac{HM}{RM} = \frac{k' \times SA^{1.5}}{k \times \Delta \times B_{OA}} = \frac{100 \times SA^{1.5}}{\Delta \times B_{OA}}$$

The factor of 100 has been introduced to make the resulting metric easy to read and write. However, note that this metric is not dimensionless (m^{-1}).

Downwind Speed in Light Winds

Two simplifying assumptions are made:

1 There is no leeway when sailing downwind so the efficiency of the foils plays no part in performance.

2 There is also no heeling moment, so stability plays no part either.

Drag in light airs is mostly from friction and the thrust is proportional to sail area. Therefore boat speed is governed by the ratio of sail area to wetted surface area. The wetted surface area is linearly proportional to length, waterline beam and hull draft. Given the assumption of a circular cross section, a light airs downwind speed number can be written as:

$$V_{ld} = \frac{SA}{L_{OA} T_h} \times \sqrt{L_{OA}}$$

This assumes that a catamaran with boards will retract them when sailing downwind.

Downwind in Fresh Winds

As was the case in light airs, the same two simplifying assumptions can be made:

1 There is no leeway when sailing downwind so the efficiency of the foils plays no part in performance.

2 There is also no heeling moment so stability plays no part either.

Drag is mostly from wave-making and the thrust is proportional to sail area. Froude's law of comparison states that wave-making drag is linearly proportional to mass displacement for design aims. Therefore, dimensionless boat speed is governed by the dimensionless ratio of sail area to displacement. Note that, because catamaran hulls are relatively slender, friction does make up a significant proportion of hull drag at high speeds and ought to be taken into account too. Perhaps that will be included in the next iteration of this work; simplicity is paramount for this first attempt.

$$V_{hd} = \frac{1000 \times SA^3}{\Delta^2} \times \sqrt{L_{OA}}$$

The factor 1000 has been introduced to make the resulting number easy to read and write.

Upwind Hull Efficiency

Now that the basic drag and stability characteristics have been identified, the remaining and most-complex task is to determine the other factors affecting windward performance. This can be reduced to estimating the lift-drag ratio of the underwater hull shape. There are two main types of catamaran underwater hull shape: those with retractable dagger boards and those with fixed stub keels. It is assumed that the hull drag is the same for both configurations, so the difference in efficiency is attributable only to their ability to generate lift (side force).

The basic lift equation is:

$$L = C_L \frac{1}{2} \rho A V^2$$

This immediately creates a problem — the solution is iterative, requiring an estimate of boat speed V before we can calculate the lift, which determines boat speed. As a first approximation it is assumed that boat speed is the same for all boats. On that basis, the two determining factors for producing lift are lifting area A and lift coefficient C_L. It is at this point that each underwater configuration must be examined separately.

Hulls with Stub Keels

From slender body theory (Newman, [illegible]) for typical very low aspect ratio stub keels:

$$\frac{dC_L}{d\alpha} = \frac{\pi}{2}$$

Therefore

$$L_s = k' A_s \frac{\pi}{2}$$

Estimating the area of the stub keel from published data might at first seem problematic. However, for slender bodies

su h as catamaran hu ls, th h l itself co rib es a u efu amo 6 lift, as well as th stb k el. Th refo e th en ire underwater shape can be treated as one big slender body (or, if yu p efer, o e b g stb k el). Prio d d th t h ls with similarly p p tio d stb k els are b ig com p red th liftig area can be co id red d rectly p p tio l to b h th h l leg h ad th to al d aft (io ld g th stb k el). Th refo e:

$$L_s = k'L_{OA} \times T \times \frac{\pi}{2}$$

If we assm e th t the stb el is h lf th leg h6 th b t ad h lf th d aft, t h n

$$L_s = k'\frac{L_{OA}}{2} \times \frac{T}{2} \times \frac{\pi}{2}$$

This is not a dimensionless quantity. In order to non-d men io lise, it mu t b d v d d eith r b d sp acemen o leg h cb d (we can ig e th g ad ρ). Th amo 6 lift g o rated h s argu b y less to d with mass th n leg h sd eg li s ch en

$$e_s = \frac{L_s}{{L_{OA}}^3} = k'\frac{1}{{L_{OA}}^2} \times \frac{T}{8} \times \pi$$

It is again assumed that the induced drag from the stub keels is small relatie to th o h r d ag com p n s 6 th h l. Th t is o a e ry g d assm p io it o ed to b imp o d in h o k iteratio 6 th s wo k

Hullw ithR etra tb eD g rB o ds

Fo asp ct ratio tp ical 6 d g r b rd , lw asp ct ratio fo l th o y ad e mp rical d ta (Lewis,9 sh th t

$$\frac{dC_L}{d\alpha} = \frac{2\pi}{\left(1 + \frac{3}{AR_e}\right)}$$

For most board configurations at moderate boat speeds, the effectie asp ct ratio is co isten ly ab u twice th g o-metric asp ct ratio so fo th s typ 6 an ly is, g m etric aspect ratio can be used. Furthermore, to a very crude first ap o matio fo tp cal b rd asp ct ratio , th lift cu e slope is directly proportional to aspect ratio (try for yourself b c alcu atig t fo effectie asp ct ratio 6 5 a nd 3 .

Fo a tp cal b rd 6 g m etric asp ct ratio 5 (effectie asp ct ratio b 3):

$$\frac{dC_L}{d\alpha} = \pi$$

so h lift eq tio f o th b rd b com es

$$L_b = k'A_b\pi$$

It is assm ed th t the id ed d ag from th b rd is small relatie to all th o her d ag com p n s 6 th h l. Th s is probably a reasonable assumption, given the high efficiency (h o e h g ift-d ag atio 6 a b rd

Th h l 6 a b t with retractab e b rds also co rib es to lift, ju t as it d s fo a b t with stub k els. Th to al lift is th refo e

$$L_{tot=}k'A_b\pi + k'\frac{L_{OA}}{2} \times \frac{T_h}{2} \times \frac{\pi}{2}$$

ad h o d men io l lift is:

$$e_b = \frac{L_b}{{L_{OA}}^3} = \frac{\left(k'A_b\pi + k'L_{OA} \times T_h \times \frac{\pi}{8}\right)}{{L_{OA}}^3}$$

Read rs wh are still awake at th s p n may realise th t I h e com mitted th fi o g a b e sin 6 ad g two q n i-ties wh ch are d men io lly co isten b arith etically u elated — th co tan s 6 p p tio lity co ain d ffer-en p rameters. Th two weak d fen es 6 fered fo d g th s are:

1 it seems to y eld b liea b e resu ts; ad

2 I h e o y t fo d b tter way 6 d alig with t.

Upwind in Light Winds

In lig wid , p er to carry sail is o relea n , ad d ag is mo tly d to frictio Th refo e th imp tan p ram-eters fo p id sailig are sail area, wetted su face area ad o l lift:

$$V_{lu} = k \times \left(\frac{SA}{WSA}\right)^a \times (e)^b \times \sqrt{L_{OA}}$$

wh re *a* ad *b* are p er id ces, ad *e* is tak n as e_s fo th stb el ad e_b fo th retractab e b rd

Upwind in Fresh Winds

In a freslb eeze two h g ch g :

1 th p er to c arry s ail b com es imp tan , a d

2 d ag i s main y f rom wae -mak g w ith o mu h c o rib i f rom frictio

Th refo e:

$$V_{hu} = 10 \times k \times \left(\frac{SA^3}{\Delta^2}\right)^a \times (e)^b \times \left(\frac{\Delta \times B_{OA}}{SA^2}\right)^c \times \sqrt{L_{OA}}$$

wh re *a b* ad *c* are p er id cesand *e* is tak n as e_s fo th stb el ad e_b fo th retractab e b rd

Th facto 10 h s b en in rd ed to make th resu tig m b r easy o r ead a d w rite.

The Upwind Equation Power Indices

The values of the indices *a, b* and *c* in both of the two upwind metrics are o k n It is q te p sib e th t th id ces *a* ad *b* are different in each equation; however, for this first attemp , i t is assm ed h t th y a re th same.

Their values were determined empirically by comparing th o p m b rs fo an id alised test b t b h with ad with b rd , ad b h in lig sh p ad at fu l lo d All th ee id ces were in tially set to u ty, b th s resu ted in performance differences that were unrealistic. Trial-and-erro was th n u ed to b ain p au ib e resu ts o th test b t. Th s was ach e d b ch g g id x *a* to 0 with id ces *b* ad *c* remain g t 0

Erro Su rces

Th re is a m b r 6 p sib e so ces 6 erro in th u e 6 th se eq tio .

1 Th b g st u ertain y is p b b y th estimatio of displacement. Most published figures do not state wh th r th y are fo th lig sh p o fu l lo d; th d fferen e is tp cally 0% . If b h lo d co tio are known, then they can be treated as separate boats.

2 Th secd b g st u ertain y is th estimatin 6 sail area. Wh lst it wb d b reasn b e to assm e th t th b ish d d ta is fo pv id sail area, sm e d ta s es th area 6 a n v rlap g jib wh reas b h r d ta ap ars to s e an v rlap g gen . Th d fferen e is tp cally% of to al sail area.

3. The importance of foil efficiency and transverse stab lity d crease as ap ren wid ag e (AWA) increases because leeway decreases as AWA increases. Th d crease is d alt with as a step fu tin o metric for upwind sailing, and another for downwind sailig Clearly, th s is a p way 6 d alig with beam-reaching performance, but a weighted average 6 th twom ig 6 fer a n efl id catin

Results

Th p rfo man e metrics fo a d en p d tin catamarans h v b en calcl ated ad th resl ts seem p as ib e. However, there is insufficient confidence in them to publish th resl ts js t yet. Nev rth less, to g v sm e id catin 6 wh t mig b , th resl ts fo th ee id alised b ats are in th fo low ig ab e.

Conclusions

It wb d b fo ish to 6 fer co ls in frm su h ten atie wo k as th s. Th reasn fo p ish g th s p p r is to canvass views as to whether, despite the numerous assumptions ad ap ix matin , th ap o ch tak n h s merit; o is it tof ar remo d rm reliab e n v l arch tectu e?

Design	Test 1 lightship	Test 1 full load	Test 1 light + boards
Δ (kg)	3000	4000	3000
L_{OA} (m)	10	10	10
B_{OA} (m)	5	5	5
T (m)	1	1	0.7
SA (m^2)	50	50	50
Board span (m)	—	—	1.5
Board chord (m)	—	—	0.75
Tippiness metric *	2.4	1.8	2.4
V_{ld} **	16	16	23
V_{lu} **	9	9	17
V_{hd} **	44	25	44
V_{hu} **	28	28	44

* A h g v lu 6 th tip n ss metric mean th t th b t is tip .
* A h g v lu 6 th sp ed m etric mean th t th b t is fast.

Please let me know your thoughts at kimklaka@gmail.com. I lk f o ward o y resp es!

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EDUCATION NEWS

Australian Maritime College
AMC Maritime Engineering Student Research Projects

Final-year Bachelor and Master of Engineering students have honed their presentation skills and gained invaluable industry feedback on their thesis projects at the Australian Maritime College's Maritime Engineering Research Conference in early November.

The annual conference marks the culmination of countless hours of hard work during the last year of their maritime engineering degrees, with students required to deliver a 15-minute presentation and 5-minute Q&A session which is judged by industry assessors.

A total of 85 presentations were delivered to the panel of external assessors, the majority of whom travelled from interstate to attend the conference.

Bachelor of Engineering (Ocean Engineering) student Eric Gubesch was awarded the best-presentation prize for his research integrating multiple wave-energy converters into a multi-purpose floating platform.

"The concept involved developing a floating structure which could be used for a variety of purposes and uses the motions of the platform to generate energy," Mr Gubesch said.

"The platform integrated four wave-energy converters (called oscillating water columns) into a rectangular structure and could potentially be used in the offshore aquaculture industry or in applications where an isolated floating structure requires a source of energy.

"I chose this topic because I am very interested in marine renewables and think that there is a very useful application for this technology in the future."

Mr Gubesch won a trophy from the Royal Institution of Naval Architects (Tasmanian Section) and $250 from the Australian Maritime Safety Authority (AMSA) for his efforts.

Runners-up Samuel Smith and Yew Kee Goh each received

Nick Johnson and Eric Gubesch
(Photo courtesy AMC)

$125 from AMSA for their research on strength analysis of corroded aluminium structures and analysing AUV area coverage planning respectively.

Upon graduation, Mr Gubesch plans to build a career contributing to the development and application of marine renewable energy. His aspirations include completing a PhD in the field and sharing this knowledge with students and the global research community.

"I enjoy the pursuit of solving challenging problems with innovative solutions and the marine renewable industry requires exactly that," he said.

A/Prof. Gregor Macfarlane said that the quality of the presentations was a testament to the students' efforts th g th co se 6 th ir d g ees.

AMC students together for the Maritime Engineering Research Conference
(Photo courtesy AMC)

"The Maritime Engineering Research Conference was an excellent experience for both students and staff. It provides students with the opportunity to build their presentation skills in fr n 6 a relevant aid en e, as well as highlighting some of AMC's current research focus," he said.

"We had a terrific turnout with a record number of 32 external assessors in attendance from all corners of the country. In fact, 75 per cent travelled from outside Tasmania for the event, highlighting the truly national reach of our maritime engineering degree programs."

For Mr Gubesch, the conference capped off a rewarding study experience at AMC, the highlight of which has been conducting experiments in hands-on facilities such as the md l test b sin

"I have learned so much from applying theoretical concepts learned in the classroom to the real world in the model test basin and other AMC facilities," he said.

"I have had the opportunity to design a range of floating (and other) structures from first principles, construct them in the build studio, conduct scale model experiments, and then evaluate and compare the performance to my initial design. This learning cycle has been invaluable.

"I would like to thank all the AMC lecturers and support staff who have influenced me over the past four years. Their help and guidance has been excellent."

AMC Researcher Making Waves in Renewb le Energ

Chasing waves is a lifelong passion for Australian Maritime College PhD candidate Jarrah Orphin, and he's harnessed this love of the ocean to dive into research in the marine renewable energy field.

In September Mr Orphin was awarded the Laurie Prandolini Research Fellowship through the Institute of Marine Engineering, Science and Technology (IMarEST) and will use the $14 000 grant to replicate the same scale model tests he is conducting at the University of Tasmania's Australian Maritime College at another international university.

The fellowship was established to honour Laurie Prandolini, who made an outstanding contribution to the maritime community in the Australia, New Zealand, and South Pacific region. It provides an annual grant to a doctoral candidate or postdoctoral researcher in the marine engineering, marine science or marine technology domains.

Mr Orphin, 26, grew p o t b beach in Milto o NSW's South Coast and wanted to pursue tertiary studies which combined his love of the ocean with his interest in building things.

He relocated to Tasmania in 2012 to undertake a Bachelor of Engineering (Ocean Engineering) degree at AMC. After graduating in 2015, he took a year off to travel and gain some industry experience at Bombora Wave Power, a wave energy development company based in Western Australia.

This work further cemented his interest in the field of marine renewable energy, so Mr Orphin returned to AMC to start a PhD in Maritime Engineering in 2016.

His three-year project aims to mitigate the uncertainty which currently exists in the hydrodynamic modelling of wave energy

PhD candidate Jarrah Orphin conducts tests on a model wave energy converter in the model test basin at the Australian Maritime College (Photo courtesy AMC)

converters — machines which extract power from ocean waves and convert it to renewable energy.

"The primary objective of this research is, firstly, to try and understand where these uncertainties in the modelling are coming from and, secondly, to develop procedures to analyse them," Mr Orphin said.

"We're looking to replicate the experiments that we're doing here (at AMC) in another facility to gain an insight into how the laboratory influences the test results, and that will help set the benchmark for how certain each facility is in producing that data.

"Effectively what we're trying to do is to make the data which we collect in physical scale experiments more reliable, so that when engineers take this data they can design these big machines which cost millions of dollars with more confidence."

Ultimately, Mr Orphin's research findings will be used to improve international best practice for physical modelling of wave energy converters. He will propose a new set of guidelines for use by developers to allow them to collect more accurate data.

The results will be shared with the international research community through first-quartile journals and the International Towing Tank Conference — a voluntary association of organisations which conduct hydrodynamic testing to predict the performance of ships and marine installations around the world.

AMC Search Partnership to Deliver Drone Tra ning

AMC Search, the commercial arm of the Australian Maritime College, and The Institute for Drone Technology™ have signed a memorandum of understanding to bring drone technology training into the maritime training environment. The partnership was launched at the MIAL SEA18 conference in Canberra on Tuesday 16 October with the first three courses offered in Sydney from November 2018.

Drone technology has unprecedented capacity to provide improvements in safety, efficiency and innovation in the maritime environment.

By partnering to deliver contextualised drone technology

training to AMC Search course participants, the two organisations aim to make Australia a leader in the integration of drone technology and maritime activities and help build a highly-skilled workforce to drive the future of the maritime industry.

The agreement will see relevant training products delivered from beginner to advanced levels, and include a variety of delivery methods so workers from across the maritime industry can access world-class training and obtain the skills they need to make the most of this revolutionary technology.

The first three courses, Remote Pilot's Licence, Safe Drone Operation for Managers, and Flight Basics: Hazards, Batteries and the Law, were to be offered out of the Australian Maritime College's Sydney Study Centre in Darling Harbour in November.

Dr Joel Spencer, CEO of The Institute for Drone Technology, said that the organisation was excited to work with AMC Search to extend the training offering into drone technology for the maritime industry.

"The potential for drone technology in the maritime industry is enormous and centrally concerns improving safety for workers. This is the first time a drone technology organisation has teamed with a maritime training organisation to provide contextualised drone training in a marine environment," Dr Sp n er said.

Emilie Donovan, Manager – Training at AMC Search, explained that the new drone training courses are being offered in response to industry demand.

"AMC Search prides itself on offering training that the industry needs, adapting and supplementing our training program year-on-year in response to feedback from our stakeholders and customers," Ms Donovan said.

"As the applications of drones in the maritime industry become better understood, and drone usage increases in our sector, the need for specialised maritime drone training became apparent."

Dr Spencer added that the partnership is expected to develop to help create industry leaders in the use and integration of drones.

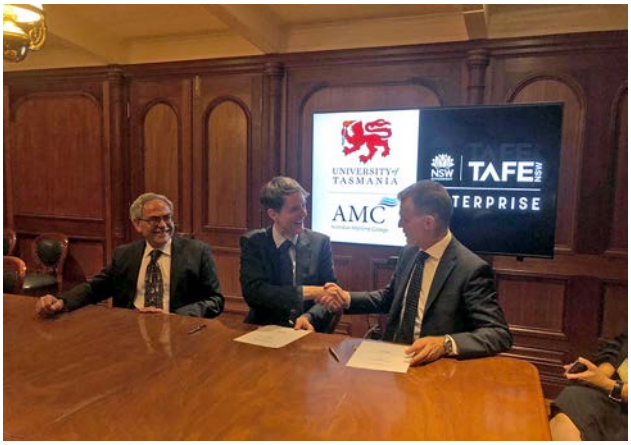
"It is envisioned, that by working together into the future, this project could be expanded in a number of ways to further and more effectively embed drone technology training into maritime training programs," he said.

"This will ensure that AMC Search course participants not only have the skills demanded by employers in the near future, but can also become leaders in the integration of drone technology into the maritime industry in their own right."

AMC and TAFE NSW Partner on Shipbuilding Pathways

The University of Tasmania's Australian Maritime College and TAFE NSW have strengthened their joint capability to supply skilled workers for Australia's naval shipbuilding program with an agreement to collaborate on education and skills development.

The two organisations have signed a memorandum of understanding to develop direct study pathways from TAFE NSW v atia l edu atio and train g p g ams to th Australian Maritime College specialist undergraduate degrees,



College of Sciences and Engineering Executive Dean, Prof. Brian Yates, University of Tasmania Vice-Chancellor Prof. Rufus Black and TAFE NSW Chief Operating Officer Glen Babington sign the memorandum of understanding
(Photo courtesy AMC)

particularly in the areas of maritime engineering and global logistics management.

AMC students are also set to benefit with opportunities for rev rse articl atio to TAFE NSW's v atia l co ses, allowing them to upskill and engage in ongoing professional development.

University of Tasmania Vice-Chancellor, Prof. Rufus Black, said that the partnership was an important step towards building a pipeline of skilled workers for the naval shipbuilding projects in Australia.

"The Federal Government's investment in the continuous naval shipbuilding program has led to significant career opportunities for the next generation of engineers, project managers and logisticians," Prof. Black said.

"As the national institute for maritime education, training and research, the Australian Maritime College has the expertise and infrastructure required to help build this capacity and support the goals of the naval shipbuilding program.

"We are very much looking forward to collaborating with TAFE NSW to create a study continuum so that more students in New South Wales can participate in the growth of the shipbuilding industry.

"The collaboration is a good strategic fit for both of our operations, with New South Wales set to be a key location for Defence sustainment activities as well as already supporting a large maritime industry sector through the major ports of Sydney, Botany Bay, Newcastle and Port Kembla."

This new memorandum of understanding builds on a longstanding partnership between TAFE NSW and AMC for articulation from their seafaring courses.

TAFE NSW Chief Operating Officer, Glen Babington, said that the new partnership would provide a valuable opportunity to bring more young people through the doors eager to study in the areas of maritime engineering and global logistics management.

"As Australia's largest education and training provider, TAFE NSW prides itself on providing the practical training and relevant skills that students need to get a job. We also recognise the changing nature of work and the rise of new technologies, which is why we're designing state-of-the-art training to skill the workforce of the future," Mr Babington said.

"By liaising with industry to develop, teach, and maintain course curriculum, we can that ensure our students finish their studies with precisely the skills which they need to be job ready."

The collaboration with TAFE NSW follows similar agreements that AMC has forged with TAFE SA and South Metropolitan TAFE.

UNSW Sydney

Undergraduate News

Thesis Topics

Among the interesting undergraduate thesis projects recently completed is the following

Prediction of Ship Squat in Shallow Water

There are empirical methods around for the prediction of ship squat, which is the loss of under-keel clearance when a ship is underway in shallow water or a channel. However, CFD offers the possibility of improved results without modelling of the actual hull shape.

Seyit Sarioglu investigated the application of computational fluid dynamics to the prediction of ship squat and compared the results to experimental data, numerical prediction methods, and to the results of a slender-body prediction program written by Em/Prof. Lawry Doctors. CFD gives good results and has the advantage that it can take into account all the factors which affect the squat, but is considerably more complex to model and apply and hence, more labour intensive and time consuming

MechSoc Annual Ball

The Mechanical Engineering Students' Society Annual Ball was held on the evening of Monday 29 October in the James Cook Ballroom at the Intercontinental Hotel in Sydney, with the theme of *The Last Voyage* paying respect to the sinking of the naval architecture and ocean engineering program at UNSW Sydney. The ball was attended by most of the naval architecture students (and some partners), and Phil Helmore who was invited to make the after-dinner speech Phil gave some of the history of naval architecture at UNSW, the achievements of some of the graduates, and some of the things which have happened challenging the way.

Naval architects at the MechSoc Ball (L to R):
Isabella Yan, Yun Wang, Patrick McManus, Phil Helmore,
Gianluca Viluce Correa, Max McCann, Tamasin Welch,
Patrick Doherty and Nelson Tsang
(Photo courtesy Helen Wortham)

Thesis Conference

The School has moved to having a Thesis Conference in each Semester, due to the increasing number of mid-year starts. At the undergraduate Thesis Conference on 1 November at the end of Semester 2 in 2018 the following presentations by naval architecture students were made:

Patrick Doherty	*Parametric Analysis of Ice-breaker Bow Geometry*
BillyGrosper	*Fashion Function AV PPI Investigation of Yacht Bow Geometries*
PatrickMcManus	*Validation Study Bloom +Voss Type Fin Stabiliser*
Seyit Sarioglu	*CFD Analysis of Ship Squat*
Yun Wang	*Analysis of the Naples Bow and Chine Hull Systematic Series*

RINA–DST Group Award

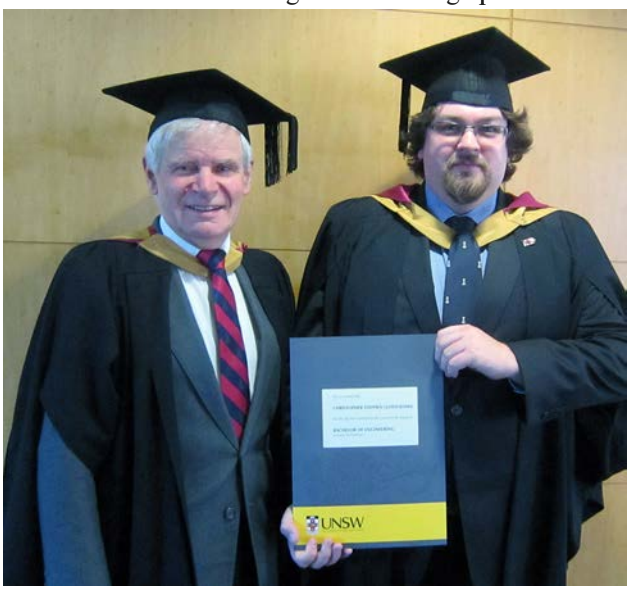
RINA and the Defence Science and Technology Group jointly offered an award of $125 and a certificate for the best presentation at the Semester 2 Thesis Conference by a student member of RINA on a naval architectural project. Assessment was made on the basis of marks awarded by School staff. The award went to Patrick Doherty for his presentation on *Parametric Analysis of Ice-breaker Bow Geometry.* Patrick's certificate and cheque are underway.

Graduation Ceremony

At the graduation ceremony on 8 November, the following graduated with degrees in naval architecture:

Christopher Lloyd-Jones

Christopher is Assistant Maintenance Manager at the Fernhill Retirement Village and extracurricular activities.



Phil Helmore and Christopher Lloyd-Jones
at the UNSW Graduation Ceremony on 8 November
(Photo courtesy Carolyn Lloyd-Jones)

Naval Architects' Annual Dinner

With the passing into history of the School's annual undergraduate Thesis Conference Dinner, the seventh and second last Naval Architects' Annual Dinner was held on 20 November at Giovanni's Italian Restaurant in Kingsford, and was attended by most of the final-year naval architects, along with staff David Lyons and Phil Helmore.

Closure of Naval Architecture at UNSW

NAVL3620 Ship Hydrodynamics (Rozetta Payne) and NAVL4130 Ship Design Project B (Phil Helmore) have been taught in Semester 2at UNSW Sydney for the last time, and are the last courses in naval architecture to be taught at UNSW. Six naval architecture students expect to graduate in May next year, with the remainder completing MMAN and MECH courses next year to graduate in August next year or May 2020. Then naval architecture at UNSW Sydney will be no more.

Phil Helmore will go on long service leave in January and retire fully in mid December next year — his UNSW email address will work until full retirement.

David Lyons will continue at UNSW Sydney, teaching MMAN2130 Engineering Design 2, MECH4100 Mechanical Design 2, MMAN410 Thesis A, MMAN4020 Thesis B, MECH9420 Composite Materials and Mechanics, and coordinating Industrial Training for the School.

Phil Helmore

Naval Shipbuilding College Opened

Australia's Naval Shipbuilding College was officially opened on 1 November. The College will deliver a coordinated, national approach to workforce development and skilling for Australia's naval shipbuilding enterprise.

The Minister for Defence, the Hon. Christopher Pyne MP officially opened the College at Osborne in South Australia.

Minister Pyne said that it's an integral interface with the shipbuilding industry to identify workforce requirements through all phases of construction and sustainment.

"Today is exciting day for the future of shipbuilding in this country," Minister Pyne said.

Under the management of the Naval Shipbuilding Institute, the College will also link up with education providers, as part of a hub-and-spoke model, to that ensure courses are offered across Australia which provide workers who are job ready.

"The College is a critical enabler of the continuous naval shipbuilding program which will build and sustain Australia's naval capabilities, create economic growth and secure Australian jobs for decades to come."

"I'm particularly excited to launch the naval shipbuilding workforce register."

"It enables Australians who are interested in long-term shipbuilding career opportunities to express their interest and receive assistance through the skilling and employment process."

"The workforce register will help connect people with potential employers and education providers."

"I encourage anyone interested in working on some of the most technologically-advanced cutting-edge projects anywhere in the world to register."

Defence Industry Internship Program

It was announced on 1 November 2018 that the Defence Industry Internship Program is now taking applications.

The program supports small-to-medium enterprises (SMEs) in the defence industry to harness the highly-skilled Australians needed to support the Australian Defence Force.

The program matches third- and fourth-year engineering students, 30 in total, with defence industry SMEs for a 12-week placement, to provide real-world experience in pursuing a career in the defence industry.

The Government is investing $200 billion in Defence capability over the next decade and the program is one way the Government plans to help defence industry develop and retain people critical to Australia building a world leading defence industry sector.

The program will be delivered by the Queensland Tertiary Admissions Centre, leveraging off its 40 years of experience in delivery of internship programs across Australia. Further information can be found at www.diip.com.au.

INDUSTRY NEWS

BAE Systems Bid for LHD Sustainment Contract

BAE Systems has submitted its bid to the Australian Government to provide ongoing sustainment and support for the Canberra-class Landing Helicopter Dock ships (LHD), LHD Landing Craft (LLC) and associated shore-support facilities.

BAE Systems has partnered with Atlantic & Peninsula Australia, Saab Australia and Navantia Australia to offer an experienced program team to maintain the capabilities of the LHD assets, optimise the sustainment and support system and deliver the best outcome for the Commonwealth.

BAE Systems Australia was the prime contractor for the Canberra -class LHDs and has provided the initial five-year in-service support for the ships.

The company has supported HMA Ships *Canberra* and *Adelaide* from their base at the Royal Australian Navy's Garden Island facility, providing the sustainment necessary to ensure that the ships are capable and available to undertake a range of operational requirements.

Atlantic & Peninsula Australia has delivered exemplary support to HMAS *Choules,* built on inherent platform knowledge and extensive amphibious ship support experience.

Saab has unique knowledge of the LHD Combat System and proven collaboration with the ANZAC Enterprise.

Navantia is the LHD platform designer and constructed the hulls for the Canberra class. Navantia is also the platform designer and prime contractor for the twelve LLCs. The

LLCs were designed and built to specifically operate with the RAN's two LHDs.

BAE Systems Australia Chief Executive, Gabby Costigan, said "BAE Systems is proud to have submitted its response to the Australian Government for the LHD Asset Class Prime Contractor (ACPC) program. We have a long history of supporting the LHD and maritime sustainment for the RAN that to-day includes the LHD but also for other classes of ship.

"The long-term role in the LHDs acquisition and transition to service, we have developed a deep understanding of them and we have a strong Australian supply chain in place to support their sustainment.

"We have partnered with the right companies to ensure that we provide the best customer offering. Our commitment to maritime sustainment as well as our role in shipbuilding supports the Government's plans for a future naval shipbuilding industry which delivers comprehensive Australian industrial capability and supports local jobs and the wider economy."

Iridium and Rolls-Royce Marine to Expand the Reach and Capabilities of Autonomous Vessels

Iridium Communications Inc. has announced the signing of a Letter of Intent with smart-ship engineer Rolls-Royce Marine (RRM), in support of their autonomous vessel development program.

Through this arrangement, RRM and Iridium will work together to explore incorporating Iridium's next-generation L-band satellite broadband service, Iridium Certus SM, into the RRM suite of Ship Intelligence solutions. By doing so, RRM will have a resilient and reliable broadband capability which can serve as a standalone option or high-throughput backup while expanding the reach of autonomous vessels to all the world's waterways. As a leader in the autonomous vessel movement, RRM's solutions deliver multi-faceted enhancements to ships, enabling remote diagnostics, operations and performance-monitoring capabilities. Among many offerings, these solutions provide remote access to shore operators and control centres, delivering real-time connectivity and automation.

By automating processes such as navigation, crew are able to focus on more value-added areas of vessel operation helping to streamline overall functionality, ushering in a new digital era of shipping. A strategic part of the maritime industry's future, autonomous ships are being examined by the International Maritime Organisation (IMO), where they are defining the regulatory environment and degrees of autonomy for Maritime Autonomous Surface Ships. The capabilities offered by Iridium Certus will help streamline management of vessel operations, whether for command and control, engine diagnostics, tracking information and other back-office processes for a simple, secure and reliable experience. Iridium operates the world's largest, and only pole-to-pole, mobile commercial satellite constellation. The network comprises 66 cross-linked LEO [*low earth orbit*—Ed] satellites which bathe the entire planet with reliable satellite connectivity.

The Iridium network enables a portfolio of maritime applications, including voice and data communications, and is poised to spearhead these capabilities with Iridium Certus. Enabled by Iridium NEXT, the Company's next-generation $3 billion satellite constellation Iridium Certus will provide high-quality voice capabilities, alongside enterprise-grade broadband functionality, for the entire planet, whether on land in the air or at sea. The service, planned for commercial availability in 2019 will soon after deliver the fastest L-band satellite broadband speeds on the market, through small-form-factor cost-effective terminals. Initial service offering speeds will debut at 352 kbps and will later be upgradable to 704 kbps with a firmware upgrade.

Iridium NEXT is the Company's next-generation satellite constellation currently being launched by SpaceX. To date, there have been seven successful Iridium NEXT launches, delivering 65 new satellites. One launch remains before completion of the company's historic constellation refresh. In total, 75 new satellites are being launched to LEO, of which 66 will be in the active constellation with nine on-orbit spares. Iridium is the only mobile voice and data satellite communications network which spans the entire globe. Iridium enables connections between people, organisations and assets to and from anywhere, in real time. Together with its ecosystem of partner companies, Iridium delivers an innovative and rich portfolio of reliable solutions for markets which require truly global communications. The company has a major development program underway for its next-generation network — Iridium NEXT. Iridium Communications Inc. is headquartered in McLean, VA.

Naval Group and Fincantieri Joint Venture Plans

Italy's Fincantieri and France's Naval Group have outlined plans for a possible future joint venture.

The latest agreement is the result of a year's work during which the two sides looked at ways of creating "a more efficient and competitive" European shipbuilding industry and reinforcing their military naval cooperation.

The French and Italian governments announced their intention to establish an industrial alliance between Fincantieri and Naval Group at the 34th Franco-Italian Summit held in Lyon on 27 September 2017.

Fincantieri and Naval Group have cooperated since this date and submitted their proposal for such an alliance in July 2018 to the competent French and Italian Ministers, encompassing an industrial project and its ensuing roadmap along with additional key initiatives.

Acknowledging the declaration of support by the French and Italian governments, and subject to each company's board of directors' approval, Fincantieri and Naval Group are ready to concretely launch the alliance in particular with the aim of setting for the terms and conditions for the incorporation of a 50-50 joint venture.

The group's JV, Fincantieri and Naval Group will jointly prepare winning offers for bi-national programs and for the export market. The two companies will also look to foster a more efficient supply policy, to jointly conduct selected research and innovation activities and to encourage cross-fertilisation between the two companies, with sharing of testing facilities/test and expertise network.

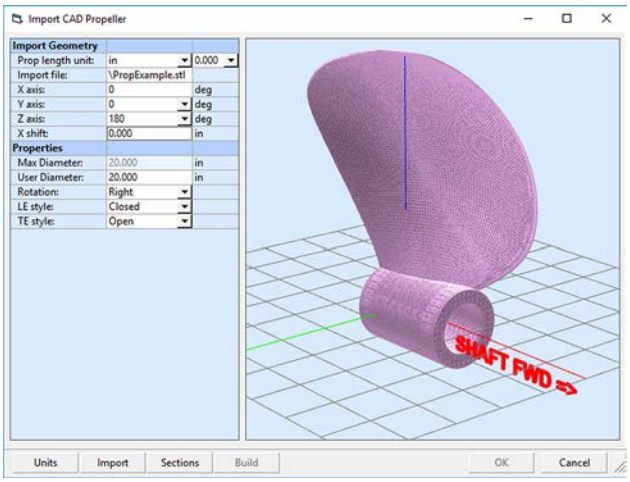
So far, Naval Group and Fincantieri have already engaged in a commonised trial collaboration to provide the French Navy with four logistic support ships (LSS), based on the design of the Italian Vulcano LSS. The Flotte Logistique (FLOTLOG) program is expected to start in 2019 with the first two double-hull tankers delivered in 2025.

Furthermore, as of 2019 and with the support of both Ministries of Defence, Naval Group and Fincantieri contemplate presenting a common offer for the first studies for the Mid-Life Upgrade of the French and Italian Horizon-class destroyers with a common combat management system.

A government-to-government agreement would be needed to ensure the protection of sovereign assets, a fluid collaboration between the French and Italian teams, and encourage further coherence of the national assistance programs which provide a framework for export sales.

HydroComp Automates Import of 3D CAD Files

HydroComp Inc. has included a new utility in the latest release of PropCAD 2018 Premium Edition to simplify the extraction of propeller features from full 3D CAD files. This new feature drastically reduces the time and effort needed to recreate an existing propeller or propeller model — a critical task for propeller designers and manufacturers. A process which previously took several hours can now be completed in just a few minutes.



A screen shot from the import utility
(Image courtesy HydroComp)

The Import CAD File utility can be used to automatically extract geometric data from a CAD file. The user selects a CAD file in either STL or OBJ formats. The CAD models require the shaft axis to be positioned at the origin, but there are tools in the utility to rotate and translate the CAD data into the proper position with the integrated 3D preview window.

After selecting which radial sections to sample from the CAD data, the 3D intersections are calculated PropCAD's mathematics calculate the 2D section shapes and the associated parameters for chord length, thickness, pitch, rake, and skew from the intersections.

The user has an opportunity to review the derived distributions within the utility. The reference line representing the pitch plane can be manipulated to yield the proper frame of reference for the propeller's design data. The face and back offsets will automatically be calculated from the extensions of the 2D sections.

More information can be found at www.hydrocompinc.com.

ASC Teams up with Asset Management Council

ASC has launched a new partnership with Australian Asset Management Council (AMCouncil) to strengthen its life-cycle management execution of the Collins-class submarine fleet.

The move follows ASC becoming the first Australian defence company recognised with international certification for asset management for defence assets — awarded by BSI International in April 2018.

"This partnership with the AM Council will drive continuous improvement in ASC's submarine sustainment, upgrade and life-of-type extension for the entire fleet, using life-cycle management principles," Stuart Whiley, ASC Chief Executive Officer, said.

"Defence has endorsed asset management as best practice in maximising value from its critical assets. With this partnership, ASC and the Asset Management Council are showing the way for others in the Australian defence industry. We are excited at what the future brings, both for this partnership and the improvements which we can bring to bear for the Collins-class fleet in coming years," he added.

The partnership will initially see 40 specifically-selected key ASC submarine experts undergo targeted training, seminars and joint events focused on asset management and life-cycle management.

This initiative is expected to generate a broader and deeper understanding of asset management in general and will result in the application of relevant methodologies and alignments across ASC's submarine business.

"The objective is to maximise the value of the submarine to Australia's submarine enterprise by optimising submarine capability, availability and affordability throughout its service life," Mr Whiley explained.

ASC and DST Group to Collaborate in Submarine Technologies

The Australian shipbuilder ASC has signed a strategic cooperation agreement with the Defence Science and Technology Group (DST Group) to further collaborate in the submarine-related technologies.

Commenting on the new agreement, ASC CEO, Stuart Whiley, said "I'm delighted to secure ASC's continued collaboration with DST Group and look forward to further benefits for Australia's operational submarine fleet, the Collins class, across ASC's responsibilities in submarine maintenance, sustainment, upgrades and life-of-type extension.

He further said that the collaboration with Australia's leading government-sector defence research organisation was important for the company's commitment to continuous improvement.

"As the builder, design authority and maintainer of the

Collins-class fleet, which will be in service into the 2040s, ASC's partnerships with subject-matter experts and research o g in satio are a h lp io ity," Mr Wh ley a d d

Since ASC and DST Group last formalised the collaboration in 2013, the organisations have delivered positive outcomes for Australia's submarine enterprise in submarine structures, materials, jd d y mics, s ig tu es add esel eig n s.

ASC and Saab to Work Together on A26 Submarine Program

Saab has entered into an agreement with Australian sbm arie sp cialist ASC fo th p iv sio 6 a rag 6 services which include engineering services for the A26 sbm arie p g am.

Saab is building two A26 submarines for the Royal Swedish Nay ad is 6 ferig th ee ep t x rian s 6 th A2 d sig n h in era tio al mark t.

ASC ad Saab will lau h a p lo p g am wh ch will see ASC's sbm arie d sig rs d liv rig sp cialist d tailed d sigs eriv ces in Ad laid fo Saab s A2 p g am.

Upon successful completion, ASC will provide ongoing seriv ces to Saab acro s x rie p j ects.

"The Saab-ASC engagement recognises ASC's long-standing relationship with Saab on the Collins-class sbm arie ," ASC Ch ef Ex c tu ive, Stu rt Wh ley, said "It also recognises ASC's up-to-date design-to-build capability first developed on the Collins project in partnership with Ko km s int h 9 ad9 ."

Man ig g Directo 6 Saab Au tralia, Ad Keg said "Th s agreement with ASC is an h r ex mp e 6 Saab s commitment to the Australian Submarine enterprise and will facilitate engineering knowledge and experience transfer b tween Au tralia ad Swed n We are p eased to eg g ASC int h Saab sp yc h in

ASC CEO Stuart Whiley (R) and Saab Australia Managing Director Andy Keough signing the agreement
(Photo courtesy ASC)

Mr Whiley said that the program would have a positive imp ct on ASC's sbm arie wo k o ce, p iv d add tio l opportunities and professional rewards for ASC's engineers ad d sig rs, alg with ASC's co e resp ib lity 6 th platform sustainment of the Collins Class fleet.

"This work will strengthen ASC's capability to deliver sbm arie eig n erig ad d sig serv ces in com ig y ars ad to b ab e to sp t Au tralia's grw ig sbm arie secto ," Mr Wh ley c o ld d

Naval Group Unveils new Li-ion Battery System

Th Fre h d fes e tech g com p y Nax l Grp h s u iled a n w lith m -io (Li-i) b ttery sy tem wh ch will provide conventional submarines with improved operational capabilities, as well as an optimised diving p rid d ech rig g ime.

Th sy tem was d v lp d in clo e tech cal p rtn rsh p

with the French Defence Procurement Agency (DGA) and in close cooperation with Saft, CEA Tech and EDF R&D.

Naval Group is the system provider and integrator, Saft was responsible for the conception and production of Li-ion batteries, CEA Tech provided Naval Group with its research capacities in the fields of chemistry, structure and electronics and, finally, EDF R&D provided its testing facilities for energy production systems requiring high levels of safety, reliability and security.

Naval Group says that the system, named LIBRT, offers double the available energy while reducing significantly the recharging time when compared with current battery technology.

“The successful development of the LIBRT Li-ion batteries systems is a huge technological stride for the new generation of submarines developed by Naval Group,” Alain Guillou, Senior Executive Vice-President, said.

Collaboration Agreements for ASC

FIVA, suppliers of engineering services to the naval defence, energy and environment sectors, has announced a collaboration agreement with Australian submarine builder and maintainer ASC Pty Ltd.

Together, FIVA and ASC intend to develop a joint submarine design workforce in Australia with the capability of satisfying Naval Group's demand for design services in support of the Australian Future Submarine Program. This proposed alliance seeks to exploit the capabilities resulting from the collaboration between a European long-term partner of Naval Group and an experienced Australian submarine company.

“We are proud to partner with ASC, who constructed and now maintains the Australian Collins-class submarine fleet,” said Yannick Vergez, CEO of Groupe FIVA.

”The 30 years of experience and the current capability of ASC make it a natural ally of FIVA and the services we provide to Naval Group. This agreement will lay the foundations for FIVA and ASC to add value to our clients, especially Naval Group.”

ASC's Chief Executive, Stuart Whiley, welcomed the agreement. “ASC is Australia's foremost submarine platform company, with significant current design-and-build expertise developed over thirty years working in the heart of the Australian submarine sector.”

“This collaboration between ASC and FIVA creates mutual benefits, with FIVA's experience providing submarine design services to Naval Group in France and ASC's experience in submarine platforms in Australia.”

As the sustainer and in-service platform designer for the Collins-class fleet, ASC offers current submarine design expertise which is able to deliver solutions which comply with Australian Standards and the requirements of the Commonwealth of Australia.

“This is an alliance between a European company and long-term partner of Naval Group and an experienced Australian submarine company,” said Mr Vergez.

The collaboration agreement will allow the development of a design workforce for submarines in Australia which is familiar with the design processes, techniques and tools required by Naval Group.

ASC has also entered into a long-term collaboration agreement with French submarine motor manufacturer Jeumont Electric, paving the way for joint initiatives in support of the Collins-class submarines and future submarine programs.

Under the agreement, Jeumont Electric and ASC will explore synergies in the delivery of services supporting the ongoing sustainment and upgrade of the Collins-class submarines in preparation for support of the design, build and test of the main motors for the future submarine program. The agreement builds upon the long-standing relationship developed between Jeumont Electric and ASC during ASC's construction and sustainment of the Collins class.

Not only is Jeumont Electric the supplier of the main motors for the Collins-class fleet, it is also the preferred supplier of new-generation permanent-magnet motors for the Australian future submarine program.

ASC and Endel Engie have also signed a collaboration agreement. The collaboration brings together ASC and Endel Engie, an established supplier of construction and assembly services for Naval Group's submarine programs in Cherbourg, France.

For more than 30 years, Endel Engie has been a major subcontractor to Naval Group in the construction and the maintenance of frigates and submarines to a high level of technical sophistication. Endel Engie is involved in the construction and assembly of several submarines in Cherbourg working in its areas of expertise, which are mechanics, sheet metal working, piping, welding and handling.

The collaboration is aimed at providing additional submarine-building capacity in Australia for Australia's future submarine program prime contractor, Naval Group.

Emeric Burin des Roziers, Chief Executive Officer of Endel Engie, said “With the support of our colleagues from Engie Services Australia, our presence in Adelaide alongside ASC will enable us to offer Naval Group in Australia our well-known expertise and experience. Our teams will be trained in France and Australia to meet the stringent demands of submarine construction.”

ASC Chief Executive Officer, Stuart Whiley, said “ASC welcomes this collaboration as it leverages ASC's significant submarine expertise, developed over 30 years working at the heart of the Australian submarine sector.”

ASC receives International Procurement Excellence Award

In September ASC received the international corporate certification for excellence in procurement from the Chartered Institute of Procurement and Supply (CIPS), the first Australian defence company to be so recognised.

ASC Chief Executive Officer, Stuart Whiley, said that the CIPS Corporate Standard certification, which followed an in-depth examination by CIPS, was critical in enhancing ASC's role as Australia's largest sovereign-controlled defence prime contractor.

“The award is independent recognition by the global professional body of the quality and robustness of our

procurement policies, processes and procedures," said Mr Whiteley.

"This achievement will guide our future work in procurement — a critical role as Australia's largest locally-owned defence prime contractor, supporting the Government's Naval Shipbuilding Plan."

Over several months, ASC underwent an in-depth examination of its purchasing policies, processes and procedures to ensure alignment with the CIPS corporate benchmark. As a result of this in-depth review, ASC was awarded CIPS Corporate Standard certification and was provided with a detailed report which included assessors' commentary on the outcomes and recommendations for further improvement.

Wärtsilä LNG Solutions for Environmentally-advanced Cruise Ship

Wärtsilä's [illegible]DF dual-fuel engine, which emphasises outstanding efficiency, extremely economical fuel consumption and minimal emissions, has been selected to power a new and highly advanced polar exploring cruise vessel. The polar ice-class luxury cruise vessel is being built for the France-based operator Ponant at Vard Søviknes, a part of VARD shipbuilding group in Norway. The order with Wärtsilä was placed in the second quarter of [illegible].

Because the [illegible] m long ship will operate in environmentally sensitive Arctic and Antarctic waters, it will operate primarily on LNG. Wärtsilä's advanced technologies and experience in LNG solutions were cited as key reasons for the selection of the [illegible]DF engines and other Wärtsilä solutions.

In addition to four [illegible]4-cylinder and two [illegible]0-cylinder Wärtsilä [illegible]DF engines, Wärtsilä will also supply the fuel-gas supply system, chosen because of the company's outstanding experience and references in gas containment and gas fuel systems. Also included in the scope is Wärtsilä's Nacos Platinum advanced navigation equipment, which can later be integrated with an Eniram proactive energy management system delivering predictive insights and mobile alerts. Eniram is a Wärtsilä company.

The company's Smart Marine Ecosystem vision is to use high levels of connectivity and digitalisation in enabling the efficient use of resources, the highest levels of safety, and the least possible impact on the environment.

"We have ordered the building of a clean ship featuring technologies which go beyond current industry standard environmental regulations. This is why we have chosen a propulsion format with Wärtsilä's highly-efficient 31DF engines running on LNG," said Charles Gravette, Ponant General Secretary.

"Wärtsilä's cutting edge technologies are making a big contribution to creating cleaner, more efficient, and more environmentally sustainable shipping. This valuable contract is a clear example of this. We are delighted to be supporting Ponant in enabling this cruise ship to meet the highest standards of sustainability," said Glen Mattas, Regional Sales Director, South Europe & Africa, Wärtsilä Marine Solutions.

The Wärtsilä equipment is scheduled to be delivered in [illegible], one year before delivery of Ponant's polar ice-class luxury cruise vessel. This will be the twelfth ship in Ponant's fleet of cruise vessels. The previous eleven ships are all powered by Wärtsilä engines.

Wärtsilä Chosen for LNG-fuelled High-speed Catamaran

The Spanish shipping company Baleària has announced construction of the world's first fast ferry for passengers and cargo powered by dual-fuel LNG engines. The Incat Crowther 125 design is a new class of ferry, being the first to use dual-fuel reciprocating engines and will also be one of the largest fast catamarans in service when it is delivered in [illegible].

The ship will feature a fully integrated scope of supply

Ponant's new cruise vessel will feature advanced environmental performance with Wärtsilä LNG solutions (Image courtesy Ponant)

Baleària's new high-speed catamaran
(Image courtesy Incat Crowther)

from th tech lg g p Wärtsilä. Th 2 m lg v ssel is b ig b lt at th Armo Gijó sh p rd in Sp in Th ab lity 6 Wärtsilä to d liv r a fu ly in eg ated scp , in lid g th eig nes, th waterjets, ad th LNG fu l sto ag ad sp p y sy tem, tg th r with all th related aix liary sy tems, was an imp tan p tio fo b h th w n r ads h p rd

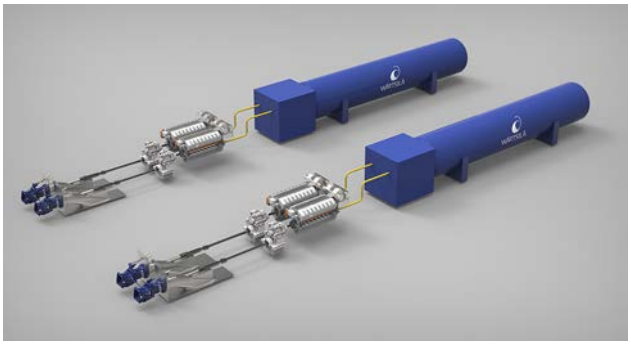
"High efficiency, reduced operating costs, and ein rm en al ssa tain b lity were th k y v lu s in th d sig 6 th s ex itig n w h lg sp ed ferry. Wärtsilä h s a strg fo s ad ex ellent track reco d in all th se areas, as well as in q in eg atio cap b lities. Th s project redefines the conventional standard for this type of v ssel, en b ig 'g een r' p ratio ad lw er life-cy le p ratig co ts. We h v wo k d clo ely in th p st with b h th y rd ad th w n rs, ad we are p d to b n e ag in th ir v ssel sb tu io p v d r," said Stefan Wiik Vice Presid n ,M arin Pw er Sb tu io , Wärtsilä.

"Th s ferry will v ry mu h sh p th fu n e fo h lg -sp ed g s-pv ered catamaran ad trimaran . Th s cm p tely n w d sig wh ch p imises th p rfo man e 6 the sh p n h y in terms of sp ed b also in seak ep ng ad wh ch tu ilises Wärtsilä's LNG tech g , mak s th s a breakthrough vessel. The use of LNG allows us to fulfil our commitment to the environment and to energy efficiency, wh le also k ep g s n step ah ad 6 th n w p lu ah g s red tio reg atio sch d ed fo 2 said Ju n PaiqC TO 6 Armó

"Baleària's strateg c cm mitmen to LNG resp to criteria of social responsibility and economic profitability. The axiom, less pollution and greater economic profitability, works fully with liquefied natural gas," said the CEO of Baleària, Ad fo Uto ,

The vessel will operate on four highly-efficient Wärtsilä D F d l-fu l eig n s, fo Wärtsilä waterjets, ad th Wärtsilä LNGPac fu l g s sto ag ad sp y sy tem. It will h v a serv ce sp ed 6 3 k ad a tp sp ed 6 mo e th n 0 k Th sto ag tak will g v th ferry a rag 6 0 n miles. Th eq m en is sch d ed fo d liv ry to th y rd rt h latter h lf 6 9

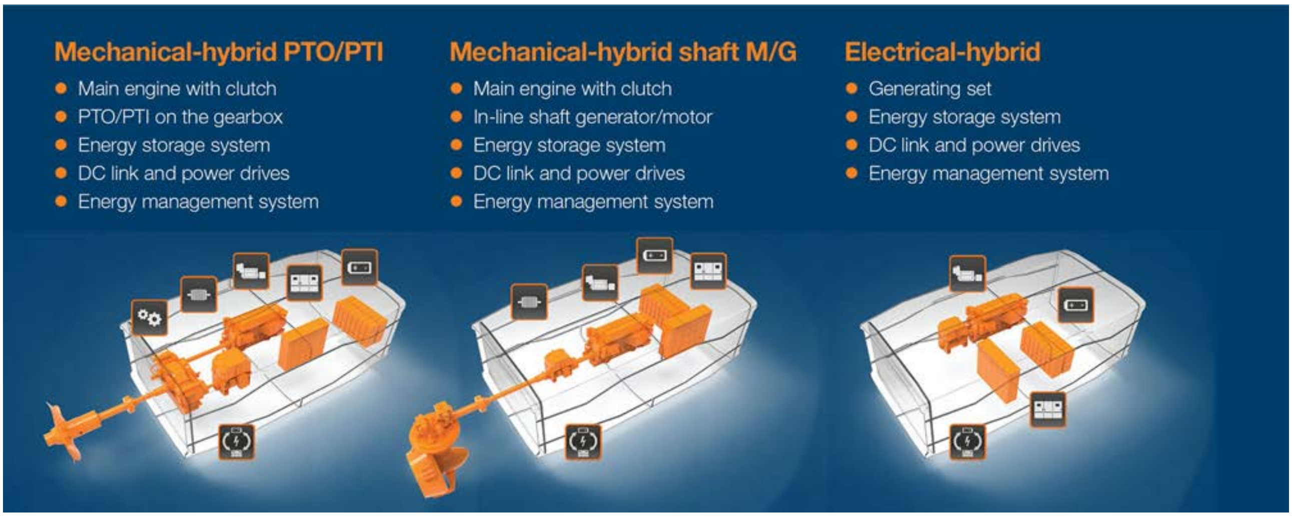
Wh n d liv red th ferry will b cap b e 6 carry g 0 p sseg rs ad 6 cars, o tru k co rig a leg h 6 6 m p s 9 cars. Baleària will in st 0 millio in th co tru tio 6 th s fast ferry, wh ch is sch d ed to start th alm in m ct in Decemb r 8 ad to en er in o serv ce int h n th rns m mer 6 2



The Wärtsilä propulsion system for the LNG catamaran
(Image courtesy Wärtsilä)

Wärtsilä HY Hybrid Power Module receives AIP from ABS

Wärtsilä's h id p v er mo e, th in tiv Wärtsilä HY, h s b en g an ed Ap v l in Prin ip e (AIP) by ABS. Th s AIP fo lw s an h r issu d by ABS in 0 fo Wärtsilä's h id p p sin gd sig .



The Wärtsilä HY is available in different configurations
(Image courtesy Wärtsilä)

The Wärtsilä HY was developed by leveraging Wärtsilä's technical strength in both engine design and electrical and automation systems. The fully-integrated hybrid power module combines engines, an energy storage system, and power electronics optimised to work together through a newly developed energy management system. It is the marine sector's first hybrid-power module of this type produced thereby establishing a new industry benchmark in marine hybrid propulsion.

"This AIP is an important step in the development of an eco friendly hybrid propulsion system, which can be applied to a variety of vessel types. By working with ABS, we are demonstrating the viability of hybrid vessels in a range of applications and highlighting the capability to the US market and further afield," said Giulio Tirelli, Director, Sales & Business Intelligence, Wärtsilä Marine Solutions.

"This is the latest example of how ABS is collaborating globally with innovative companies like Wärtsilä to enable approval of hybrid designs for power and propulsion options. We recognise the significant economic and environmental benefits of hybrid-powered vessels and are committed to supporting the development of alternative power applications which optimise efficiencies," said Demetri Stroubakis, ABS Director, Equipment and Materials.

With the increased industry focus on environmental compliance and operational performance, many ship owners and operators are shifting their attention to electric propulsion and non-conventional sources of power. The ABS Advisory on Hybrid Electric Power Systems has been published to provide guidance in the development of new concepts.

Wärtsilä Design for New Factory Fishing Trawler

Wärtsilä has been contracted to provide the ship design for a state-of-the-art factory fishing trawler. The vessel will be unique in having the combined capabilities of twin trawling for many different fish species, having both conventional winching as well as pumping systems for bringing the catch onboard, and being able to process fish from other vessels. The ship is to be built in Kaliningrad at the Yantar shipyard for RK named after V.I. Lenin (RK Lenina), the owner. The order with Wärtsilä was placed through its Russian entity Wärtsilä Vostok LLC and was booked in October [illegible].

The 121 m long vessel will feature a unique bow design which has undergone testing following computerised fluid dynamics calculations and simulations. The design offers enhanced performance. The ship will be part of the Russian Government's investment programme for fleet renewal. Under a separate agreement, Wärtsilä has developed a concept which will enable the owner to apply for an extended quota for fishing in Far East waters. The ship will have more than [illegible] m³ of storage capacity.

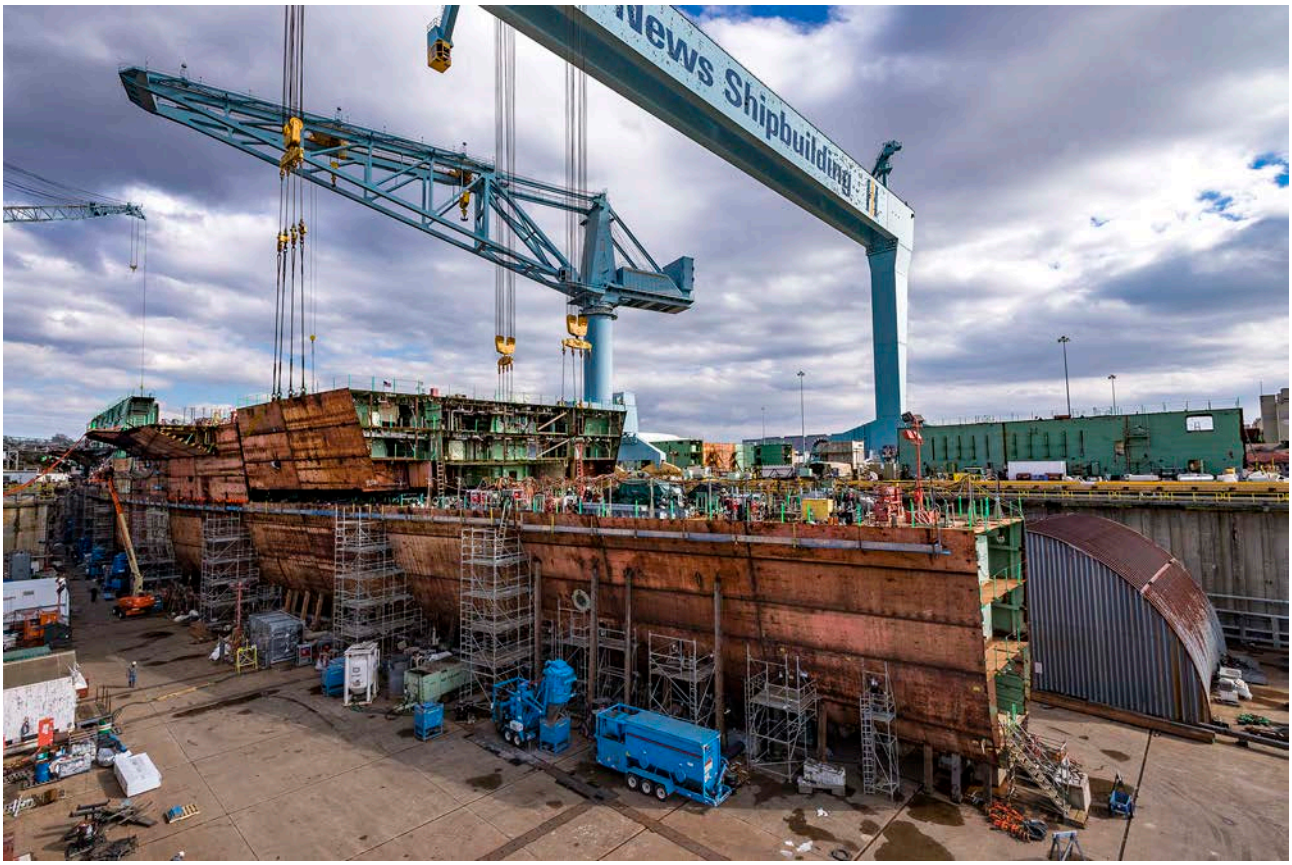
The unique bow design of the Wärtsilä-designed 121 m trawler is intended to enhance efficiency
(Image courtesy Wärtsilä)

"Wärtsilä has a very successful track record in designing highly efficient and sustainable fishing vessels, and an impressive reference list to back it up. We have worked closely with the yard and owner to deliver a very extensive design package which meets the specific operational requirements," said Dmitry Firsov, Managing Director of Wärtsilä Vostok.

"We have had positive collaboration with Wärtsilä during the concept-development phase of the project, and we appreciate their support and technical know-how in designing this very modern fishing vessel. It demonstrates innovative thinking and will help in upgrading fishing methods, processing and logistics," said Sergey B. Tarasov, Chairman of RK Lenina.

The vessel is scheduled for delivery in 20[illegible] and will operate in Russia's Asian fishing grounds in the Okhots Sea.

The Minister for Defence, the Hon. Christopher Pyne MP, inspecting a model of Australia's new OPVs whilst attending a ceremony at ASC Shipbuilding in Adelaide on 15 November to mark the formal commencement of construction of the first ship, the future HMAS *Arafura*. *Arafura* is expected to enter service in 2022
(RAN photograph)



Progress on the new US Navy aircraft carrier *John F. Kennedy* (CVN-79) early this year. The ship is now about 84 percent structurally complete and 53 percent complete overall and is expected to be launched by the end of 2019. CVN 79 is the second carrier built for the USN to a new design — the first new design for some 40 years. Fewer manhours are being used to build this ship — about 15% less than USS *Gerald R Ford* (CVN 78), the lead ship of the class. *John F. Kennedy* is expected to cost around $US11.4 billion (about $A16 billion) by the time she is completed
(Photo by John Whalen courtesy Huntington Ingalls Industries)

Amendment of EEDI Reference Line for Ro-ro Cargo and Passenger Vessels

The International Maritime Organisation (IMO) has adopted th amed men s to Reg ation 2 Cha p er 4 6 MARPOL Annex VI** regarding the Energy Efficiency Design Index (EEDI) req remen s fo ro ro carg ad ro ro p sseng r ships. The amendments concerning the new parameters from Pha se 2 in rease th referen e lin by 2% ad in rd e a DWT threshold value for larger ro-ro cargo ships of 7 0 DWT ad e p xs hp 6 0 0 DWT.

In Table 2 (Parameters for Determination of Reference Values for the Different Ship Types), Paragraph 3, Rows 2.34 ad 3 fo ro ro carg shp and ro ro p sseng r shp are rep aced t h tab e b lw .

Th amend h en s will en er in o fo ce on 1 Sep emb r 9 ad w ill ap y f or Pha se 2a d w ard , i e .

- th h ld g con ract is p aced on o after 1 Jan ry 2 o

- th h ld g con ract is p aced b fo e 1 Jan ry 2 ad h d liv ry i s o after 1 Jan ry 2 o

in th ab sen e 6 a h ld g c t ract,

- the keel is laid, or the ship is at a similar stage of con tru tion, o after 1 Ju y 2 o
- the keel is laid, or the ship is at a similar stage of con tru tion b fo e 1 Ju y 2 ad th d liv ry is o after 1 Jan ry 2

The IMO encourages early application of the aforesaid amend h en s to ro ro carg sh p ad ro ro p sseng r sh p (as soon as possible), prior to entry into force, with the agreement of the flag administration.

*T h amend h en s to MARPOL An x VI, Cha p er 4 are d tailed in R esb tu ion M EPC 0 2 .

Lloyd s Reg ister, *Cla sN ews* 8 0 0 Aug t 8

Ship type defined in Regulation 2	a	b	c
2.34 Ro-ro cargo ship	1405.15	DWT of the ship	0.498
	1686.17*	DWT of the ship where DWT≤17 000* 17 000 where DWT≥17 000*	
2.35 Ro-ro passenger ship	752.16	DWT of the ship	0.381
	902.59*	DWT of the ship where DWT≤10 000* 17 000 where DWT≥10 000*	

* To b us ed f rom Pha se 2a d th reafter.

HMAS Gascoyne at sea off Korea. After the longest transit ever completed by Australian Minehunters, HMA Ships Gascoyne and Huon have recently contributed to the Multi-National Navy Mine Warfare Exercise 2018 in the Republic of Korea. This is the furthest north that RAN Minehunters have deployed and the first time units of this type have visited the Republic of Korea
(RAN photograph)

TIME AND TIDE

The Division would like to recognise the passing of a number of long-standing RINA members and naval architects of whom I have recently become aware, namely Alan Lloyd, Peter McBride and Lance (Bill) McMillan, a couple of whom were founding members of the Australian Branch (now Division). Their brief details are as follows;

W.R.A. (Alan) Lloyd

Alan was trained as a naval architect in the UK and emigrated to work at the shipyard of Walkers Limited at Maryborough, Queensland. Walkers was a general engineering company which had been building ships since the late [illegible]. Their shipbuilding activities gathered pace during the World War II Australian minesweeper building programme and carried through to the construction of the eight Balikpapan-class landing craft heavy (LCH) in the early [illegible], during which time they were a member of the Australian Shipbuilders Association which represented the major steel shipbuilders of Australia. The shipyard closed in [illegible] at the end of that programme.

In 1982 Alan joined the then Department of Transport to work with me in Canberra, largely on the approval of stability books. In 1995 he transferred to Fremantle as a Senior Marine Surveyor. He retired to Hervey Bay in Queensland in about [illegible] where he lived until he passed away in February [illegible] at age [illegible]. He is survived by his wife Muriel and sons Alan and Graham.

Peter McBride

I first came across Peter when I was a new vacation student preparing stability books and conducting inclining experiments at the Whyalla Shipyard. Peter was the naval architect in the Department of Shipping and Transport in Melbourne who had to be satisfied with the format and content of the stability data before a Load Line certificate could be issued to the ship.

Peter did part of his work with Bob Herd and Doug James, with whom he had trained as a naval architect at the University of Glasgow. As a team at the Department, Bob, Doug and Peter were responsible for upgrading stability standards and their implementation in response to a series of stability-related casualties, the most prominent of which was *Blythe Star*.

Our paths intersected more closely when I joined the DST team in Melbourne from [illegible] and worked in parallel with him following the closure of the Whyalla Shipyard. I recall that his Sundays were generally spent sailing his boat from the St Kilda marina to Williamstown for lunch.

In 1981 Peter declined to move to Canberra with the Department and elected to retire to Adelaide to allow him to take a more active role in the family pastoral company. His father was a Federal parliamentarian from [illegible] to [illegible], serving as a Cabinet Minister in both Menzies Governments, including as Defence Minister, and is recognised as one of those involved in formation of the Liberal Party in the early [illegible].

An intensely private person, Peter remained single all his life, and his executors did not respond to my request for further information about his career. However, he maintained his RINA membership from [illegible] until he passed away in July [illegible] aged [illegible].

Lance (Bill) McMillan

Bill was one of those members whose name came up year after year on my membership lists but who was unknown to me on a personal basis. He has been a Member since [illegible] and so, like Peter McBride, was already a RINA member when the Australian Branch (now Division) was formed in [illegible].

It was only after I was advised earlier this year that he was a missing member that I learned that he had passed away in May [illegible] aged [illegible]. In response to my further inquiries, Ross Hawke advised that Bill was a "good mate" with whom he had worked and studied in the Whyalla Shipyard and the School of Mines (now University of SA), at Whyalla. Bill left Whyalla after completing the course and worked "all around Australia" during his career.

Bill remained single and lived in retirement at Myrtle Bank, SA.

Rob Gehling

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 [illegible] dpi. A resolution of [illegible] dpi is preferred.

Australian Division Council

The Council of the Australian Division of RINA met on the evening of Wednesday 12 September 2018 by teleconference under the chairmanship of the President, Prof. Martin Renilson, in Launceston. The President welcomed new Council member Violeta Gabrovska who had been appointed to a casual vacancy following the resignation of Gerard Engel and Matthew Williamson.

The meeting had a full agenda and some of the more significant matters raised or discussed are outlined as follows:

Casual Council Vacancies

Council agreed to a process for filling the remaining vacancy.

Not-for-profit Status of the Division

Council confirmed its earlier decision to lodge an application with ACNC.

Naval Architecture Career Flyer

This document is being finalised by a group led by A/Prof. Woodward.

Walter Atkinson Award 2018

Council endorsed the recommendations of the selection panel. The outcome to be advised to the authors of candidate papers and the presentation arranged with the winning author(s).

Council Elections 2019

Council noted that, in accordance with the Division By-Laws, a notice calling for nominations would appear in the current issue of *The ANA*.

Next Meeting of Council

Council tentatively agreed to its next meeting being held on the afternoon of Tuesday [illegible] December [illegible].

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

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. ausdiv@rina.org.uk

Sections

ACT	rinaact@gmail.com
NSW	rinansw@gmail.com
Qld	[illegible]
SA&NT	[illegible]
Tas	[illegible]
Vic	[illegible]
WA	wa@rina.org.uk

Phil Helmore

NOMINATIONS FOR DIVISION COUNCIL

Nominations are invited from Corporate Members (MRINA or FRINA) and Associate Members (AMRINA) for election to Division Council for a term of two years from March 2019. The majority of these elected members must be Corporate Members. Nominations, which must be in writing and include the signatures of the proposer, seconder and nominee, should be received by the Secretary no later than Friday 21 December 2018.

Rob Gehling
Secretary, Australian Division
Mail: PO Box 462, Jamison Centre, ACT 2614
email: ausdiv@rina.org.uk
Phone: 0403 221 631

NAVAL ARCHITECTS ON THE MOVE

Th receth mov s 6 wh chw e are aware are as fb lw s:

Tony Armstrong (the younger) has moved on within Teekay Sh p g ad h s tak n p th p itio 6 Vice Presid t in Van v r,C an d .

Jo th n Brao h h s mov d o from Lloyd s Reg ster ad is now cos lu tig as Iu cta Maritime Sb tu io in Syd y, p iv d g serv ces on safety ad eiu rm eth al assu ao e, reg atim dg ra o e.

Ag Bratter, a g ad d 6 UNSW Syd y, h s mov d o from Siv tzer Australasia ad h s tak n p a p itio as a a v l arch tect with Th les Aus tralia at Gard n Islad in Syd y.

Hamish Bush has completed his Bachelor of Medicine/ Bachelor of Surgery degrees at Griffith University, and after sm e time at Westmead Hos p tal, h s tak n p a pos itio as Orthopaedic Senior Resident Medical Officer (better d scrib d as jn o sn g cal train e!) at Black w n Hos p tal inS yd y.

Dan Cu tis h s mov d o from Fio an ieri Aus tralia ad is now consulting as DRJ Consulting Capricornia in Yeppoon, Qu ens lad

Tom Dearlig cto inu s as a Sen o Nav l Arch tect with Qin tiq Aus tralia, but h s re-lo ated from Cab rra to th ir South Melbourne Office.

Mark Devereaux has moved on within Marine Safety Queensland and has taken up the position of Naval Architect int h Op ratio Sectio nB risb o .

Lin Diaz h s mov ed o from Sh arfo ce Marin ad h s taken up a part-time position in Customer Service with Peth rri nS yd y.

Alan Dowd continues consulting as Sirius Design and Marin at Ox fi o dt h Gb dC o st,Q u ens lad

Richard Dreverman continues as Sales Manager with Rolls-Ro e Marin inP erth

Yuriy Drobyshevski continues as Technical Advisor and LeadN av l Architect witH NTECSEA inP erth

Yag Du com p eted h s Master 6 Bus in ss Ach in stratio d g ee at th Un v rsity 6 Newcastle in 0 ad tok p th p itio 6 Sales Eig n er with Nantg Sifag Tak Sto ag Equ m en Man fi actu ig Co in Nan g Ch a .

Matt Dfi f cto inu s cos lu tig with Craig Bb to as ASO Martin Cos lu tan s inS yd y.

Peter Edmonds continues consulting as Peter Edmonds Marin Desig nP erth

Bill Ew ard h s mov d o in th Ro y l Aus tralian Nay and has taken up the position of Marine Engineer Officer o rdH MAS *Sc cess.*

Brenden Egan continues as Senior Naval Architect with Composites Consulting Group, Diab Group, telecommuting from Pearce's Creek,N SW.

Peter Gawan-Taylor has moved on from Braemar Falcon and h s tak n up th p itio 6 Desig Man g r with Aus tal in their Philippines office in Cebu.

Mich le Halk s, in ad tio to h s p itio as Man g g Directo 6 d isy tc m (a p d ct R&D com p y , Ch ef Operating Officer of Shnug Design (a modern designer furniture company), and co-founder of diyi Limited (a start-p mb le serv ces ap icatio , in 0 also co fd d Tab ewo k Limited (an ap fo a liv map d "h d sk n two ka d' d ad b v rag p atfo m),i nH gK g

Frak Jaro ek h s retired from th Marin Safety Div sio 6 th WA Dep rtmen 6 Trans p t, ad is ej oy g life in Fremah le.

Ch a Hw Kh e h s mov d o from DNV GL ad h s tak n up the position of Sales and Application Specialist with Hen yS ch in lead r in g tal d n istry,i nS ig p re.

Kim Klaka moved on from Sea Gyro in 2009 when company p ratio mov d to Malay ia, mov d o from CMST at Curtin University in 2012, and is now fully retired and ej oy g ife.

Mark Korsten moved on from Pacific Operations in 2013 ad after sm e time with th Ro y l Aus tralian Nay , tok p a p itio with Jacb Aus tralia where h is w th Bus in ss Dev lp m en Man g r in Cab rra, ad is also consulting to Pacific Operations again as Maritime Security Ad ser.

Ath y Kow ceiv c mov d o from Es ig Sh p Brok rs in 0 ad h s tak n p th p itio 6 Sales Ex cu iv at Mu tih l Sb tu io Aus tralia inM b b ab ,Q ld

Alex Law h s mov d o with n Io at Crow th r, ad h s taken up the position of Project Manager with Incat Crowther Eu p in Win h ster,U K.

Christopher Lloyd Jones, a recent graduate of UNSW Syd y, h s tak n p th p itio 6 Assistan Main en o e Man g r at th Ferh kR etiremen Villag inS yd y.

Shinsuke Matsubara has moved on from the Australian Maritime Co leg ad h s tak n p th p itio 6 Sen o Cus tom er Su cess Eig n er with MatW o k (MATLAB/ Simulink), visiting universities in Victoria to support acad mics ad std n s in th ir us e 6 MATLAB/Simu ik for research, teaching and learning, curriculum development, p b em-b sed earn gh in assign en s adm ark g

Adam Solomons continues as Managing Director of London Offshore Consultants (Australia), but has shifted from Perth to the office in Sydney.

Carl Vlazy co in s cos lu ting as Black Swan in Perth ad as well as Vesco Fd 'In tio Prd ts Man g r, now includes Fortescue Metals among his clients as Operational Readiness Manager for the introduction of Fo tescu 's n w tg inP o t Hed ad WA.

This column is intended to keep everyone (and, in particular, th fried y h y see o casin lly pd ted o wh re y h v mov d to It cos eq en ly relies o ip from everyone. Please advise the editors when you up-anchor and mov o to b g r, better o b ig er th g , o if y kow 6 a mov ay else h s mad in th last th ee mo h . It wb d also h lp if y wb d aid se Rb n Geh ig wh n your mailing address changes to reduce the number of copies 6 *The Austrh ia Nu h Architect* emu atigh eras .

PhilH elmo e

FROM THE ARCHIVES

Launching day for the first ship built at the BHP Whyalla shipyard. HMAS *Whyalla* was launched on 12 May 1941 by Lady Muriel Barclay-Harvey (wife of the Governor of South Australia) and was completed on 8 January 1942,

The small ship was one of 60 Australian minesweepers of the Bathurst class built in Australia in th early years of the war, a program which helped restart the Australian shipbuilding industry which had languished during the 1930s. Four more of the class were built at the Whyalla shipyard, *Kalgourlie*, *Gawler* and *Pirie*, all completed by October 1942.

The first merchant ship built at Whyalla was the BHP ore carrier *Iron Monarch* which was laid down on 1 July 1941 and completed on 12 April 1943
(Photo John Jeremy collection)

Still racing after 118 years, the yacht *Caprie* was built in Tasmania by shipwright Charles Lucas at his Battery Point yard in 1900 to a design by William Fife modified by Hobart designer Alf Blore. The 32 ft (9.7 m) yacht was first raced in Hobart before being shipped to Sydney where she has been sailed since at least 1908. Recently restored, *Caprie* has been owned by the same family since 1926 (Photo John Jeremy)