# THE AUSTRALIAN NAVAL ARCHITECT

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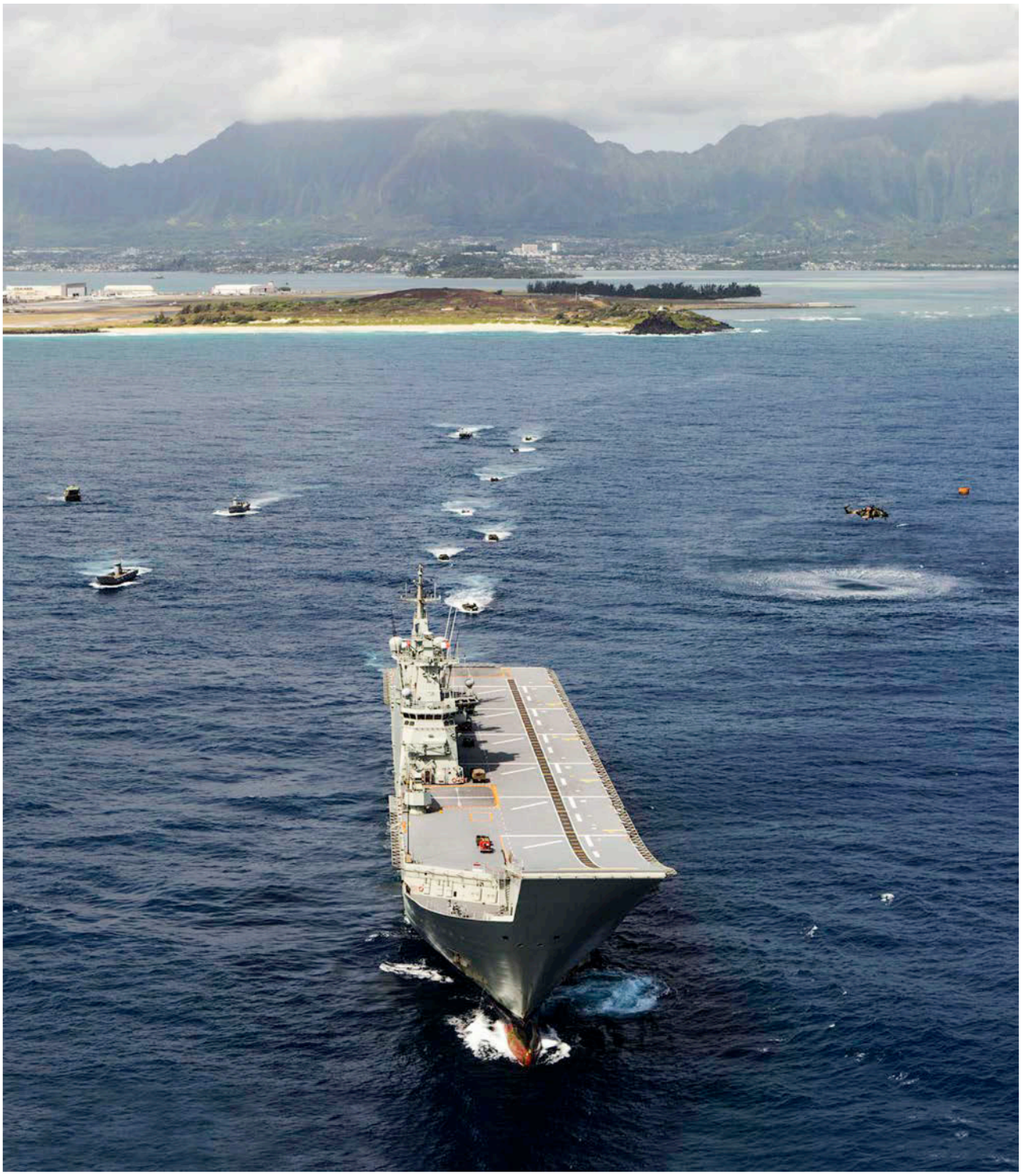

HMAS *Adelaide* preparing to embark United States Marine Corps amphibious assault vehicles during Exercise Rim of the Pacific 18 (RIMPAC 2018), Hawaii, in July.

HMAS *Adelaide* unexpectedly took a lead role in the amphibious phase of RIMPAC when the US Navy assault ship planned for that role suffered mechanical problems and remained in Pearl Harbour for most of the exercise.

HMAS *Adelaide* led HMA Ships *Success*, *Melbourne* and *Toowoomba* across the Pacific to take part in this major exercise which involved 25 nations, 46 surface ships, five submarines, 17 land forces, and more than 200 aircraft and 25 000 personnel. This major international exercise is held every two years

(RAN photograph)

# THE AUSTRALIAN NAVAL ARCHITECT

Journal of
**The Royal Institution of Naval Architects**
**(Australian Division)**

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*Cover Photo:*

An impression of BAE Systems' Global Combat Ship — Australia, selected as the preferred design for Australia's new frigates
(Image courtesy Department of Defence)

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**RINA Australian Division**
on the
World Wide Web
**www.rina.org.uk/aust**

# From the Division President

Welcome to another edition of *The Australian Naval Architect.* We are really fortunate in Australia to have such a superb publication tailored exactly to our needs. This was supported very strongly in the outcome of the recent survey of members.

The Institution as a whole is currently conducting a strategic review and has established a number of working groups to address various issues. I am on the group looking at the publication policy. It is difficult to know what the Institution's future policy regarding publications should be. We currently have two peer reviewed journals — *The International Journal of Maritime Engineering* and *The International Journal of Small Craft Technology*. These both attract papers, mainly from academics, which are peer reviewed and certainly do meet the need for academics to publish the results of their world-leading research. Of course, this is an important role of the Institution but, sometimes, I do wonder how many non-academic members read such papers?

However, we need to recognise that, today, more and more information is disseminated using electronic means. These include e-Newsletters, podcasts and webinars. Personally, I get more information this way than I can possibly read. How should the Institution address the move to more electronic communication of information? I'm very interested in members' thoughts on this — particularly younger members who perhaps make more use of modern technologies, and for whom the Institution's policy going forward to 2050 is going to be of more importance than it will be to me!

In fact, as many of the Institution's policies are more likely to affect younger members than those nearer the ends of their careers, it is a great shame to see that they don't seem to be having as much input into the running of the Institution today, and the planning for the future, as perhaps they should have.

Since the last edition I attended the very successful "launch" of NUSHIP *Sydney* in Adelaide. Somehow a float off is not as exciting as a "real" end-launch, but I know that those involved were somewhat less stressed than if they had used the old-fashioned method. It was great to meet many members at this event — and my thanks to those who arranged the invitation for me.

I also took the opportunity to attend a SA-NT Section Technical Meeting on *Submarine Design* presented by Eric Fusil. Eric, as always, gave a great presentation, which was enjoyed by those who attended. This was held on the University of Adelaide's campus and attracted a number of undergraduate students. Many of these are studying aeronautical engineering and they found the presentation on submarine design to be very interesting. I think that it's really great when it is possible for a section to hold its meetings at a university, and to attract students to attend. After all, they are the future of the profession, and our Institution. If Eric's presentation encouraged some of those students studying other branches of engineering to consider careers in naval architecture, then that will be a really good outcome. There are now a few masters degrees in naval architecture being offered, including one at the University of Adelaide,

Martin Renilson

and one at the AMC, University of Tasmania. So there are opportunities for students to move into our field. With all the naval shipbuilding on the drawing board in Australia there will certainly be plenty of exciting careers available well into the long term.

Members will be aware that the Institution has reorganised its standing committees. One of the new committees is the Maritime Innovation Committee. This is currently in the process of identifying six key disruptive technologies which will influence the maritime industry in the future. That's quite a challenge!

Personally, I think that it is quite likely that these disruptive technologies influencing our industry will come from outside the maritime industry. For example, there is a lot of work going on around the world into improving energy storage systems — primarily, but not exclusively, better batteries. If the storage of electrical energy were to become cheap, light and efficient then it is quite likely that we will see all-electric ships, which are charged up when in port. This will make a major change to the maritime industry, as well as to port infrastructure.

Another example of a disruptive technology which is often talked about is autonomy. I suspect that most of the work that is being done in this field (not radio control, which is quite different) is being done for self-driving cars. If that can be solved, and we all learn to rely on self-driving cars, then surely it will be a piece of cake to apply this to the maritime industry. Many container terminals already rely on this technology for moving containers around.

If a ship was completely autonomous, then it wouldn't even need pilots. Think of the increased safety if pilots were not required to undertake the hazardous journey to the pilot boarding ground, and then transfer from a small pilot vessel in severe conditions.

If autonomy can be applied in the commercial sector, can it also be applied to warships? Of course, there are a number

of very different issues here, including whether society will ever permit an autonomous system to fire a weapon. Personally, I think that this is very unlikely, which is why I feel that autonomous underwater vehicles will not have as big an impact as many people think. However, it was pointed out to me that once a torpedo has parted from its wire guidance it uses its own autonomy to track down, and then attack, the enemy. This can be done even although the enemy is trying to evade the weapon — and, of course, smart mines do something similar, by deciding which ship to attack.

Perhaps we all ought to put our thinking caps on (if we've not done that already) and see if we can identify disruptive technologies for our industry. It would be really interesting to get some letters and/or articles about this into *The Australian Naval Architect.*

Information on the work of all the standing committees can be found on the RINA website.

Members will be aware of IMO's role as the international authority for maritime safety, which was the reason for its formation in 1958. However, perhaps not all members realise that IMO now also plays a major role in the environmental performance of international shipping. In fact, there is a feeling from some members with whom I have spoken that IMO's focus has now moved from safety to environmental protection.

Of course, environmental protection is important, but how to handle this is certainly not black-and-white. For example, should we be encouraging cold ironing of ships in ports, which in turn requires more power stations on land? These may use fossil fuels, or renewable energy, but even the latter is controversial, with objections to dams limiting hydro power, and all the environmental issues associated with generation of power using wind turbines — and what about batteries?

Then, of course, there is the vexed issue of coastal shipping. If IMO imposes environmental regulations on ships which increase the cost of shipping, then cargo will go by rail or road instead. The net effect is very likely to be a considerable increase in emissions.

I think that environmental issues are somewhat more "big picture" than just the maritime industry. I'm not saying that the maritime industry shouldn't play its part, but any organisation which is trying to improve the environment needs to think more broadly than a single industry. Is this really IMO's role?

Finally, I am just back from another most enjoyable Victorian Maritime Industry event held in Melbourne on Friday 27 July, to celebrate Christmas in winter. This was a great opportunity to meet with many members and others in the industry, and I particularly want to thank Jesse Millar and his team for organising this event. It was somewhat novel to be wearing "Santa hats" all evening! It was also great to see quite a number of members who had travelled from interstate to be there. I am already looking forward to this event next year, and strongly recommend that members put the date into their diary as soon as it is announced.

*Martin Renilson*

# Editorial

After what has seemed, to the casual observer, a very long selection process, the BAE Systems Global Combat Ship — Australia has been selected as the preferred design for Australia's new frigates. With decisions now made on all three new construction projects, the offshore patrol vessels, the submarines and the frigates, the challenging task of getting on with the task of completing design work and starting the job of building the vessels can now begin in earnest.

Meanwhile, in May this year, the Australian National Audit Office (ANAO) published a report on the naval construction program, in which it was declared that the ambitious program carries a high-to-extreme level of risk. Reading the report, one can understand why that conclusion is reached, despite the report stating that Defence, at this early stage, is meeting scheduled milestones.

Construction of the first of the first of the new frigates is due to commence in 2020 (a year which actually begins in only 16 months' time). Some, keen to see the new ships enter service as soon as possible view that date as too late but, realistically, there is much to do before construction can start. Design work has to be progressed to a stage which can ensure production without schedule delays, and the shipyard which will build the ships is still in an early stage of construction. The shipbuilding workforce in Adelaide has, inevitably, declined as the destroyer program draws to an end, hopefully to be set on the road to recovery by constructing the first two OPVs in Adelaide, despite the less-than-optimum effect which the split construction location will have on that program.

The ANAO concluded that the start date for the frigates is early and warns that 'schedule compression presented such extreme risk that cost and schedule overrun was likely'. Some may criticise this view as overly negative, but the ANAO has a job to do and such comments can encourage those involved to prove them wrong.

All major projects involve risk. Taking no risk at all means going nowhere. It is the responsibility of everyone involved to manage it. Those of us who will be observing closely from the sidelines wish everyone involved success in their endeavours.

*John Jeremy*

# LETTER TO THE EDITOR

The global talent pool of naval architects is not a large one, and it is dwindling. We are a scarce resource in a world which still does not understand the meaning of the term. We face a universal energy crisis, a crisis second in its immediacy only to the destructive effects of global warming which is the very product of our endeavours up to now. As naval architects, we understand and appreciate the vast power the ocean holds and, I believe, we must use our skills to harness this power.

Tides, waves, currents, salinity gradients and thermal gradients all contain many times the amount of energy we need globally, and virtually none of these are being utilised. In the stretch of continental shelf which spans from Geraldton, WA, to the southern tip of Tasmania, it has been estimated that there is 1300 TWh/yr of recoverable wave power. This is five times the yearly consumption in Australia. Globally, the approximate power of ocean swells is up to 80 000 TWh at any one time and osmotic power and ocean thermal power have equally large potentials. To put this in perspective, the world's energy consumption is 100 000 TWh. With the right technology and ambition, the oceans could change our future.

So I urge naval architects to pass over offers from the Maersks and Schlumbergers of the world and, instead, lend your much-needed skills to the renewable industry. The opportunities are out there; projects like CETO and Bombora Wave Power have already reduced wave power's levelised cost of electricity to less than that of solar and wind power. This industry will change the world, but it needs our help, and every step we make towards an energy-sustainable future is one further away from a future which we and generations to come will suffer from. In the words of the man who proves that one person can make a difference, Elon Musk, 'I don't want to look at the future and feel sad'. Let's change it!

*Edward Hawkins*
UNSW Student

# COMING EVENTS

## NSW Section Technical Meetings

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

The program of meetings for 2018 (with exceptions noted) is as follows:

5 Sep Daniel Bellagamba, Account Manager Australia East Coast and New Zealand, Wärtsilä Australia
*Environmental Solutions for Ships*

3 Oct Warren Miller, Senior Design Engineer, Diab
*Replacing the Bow on* Wild Oats XI
Royal Prince Alfred Yacht Club,
160 Wolseley Rd, Point Piper

6 Dec SMIX Bash 2018

## Basic Dry Dock Training Course

DM Consulting's Basic Dry Dock Training is a four-day course which covers the fundamentals and calculations of dry docking. The next courses in Australia will be held on 16 October–18 October 2018; at Garden Island in Sydney

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

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

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

Topics to be covered include:

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

Joe Stiglich, the course leader, is a retired naval officer, qualified NAVSEA docking officer and holds a master's degree from MIT in naval architecture and marine engineering. Responsible for over 250 safe docking and undocking operations, he currently runs a series of conference and training courses for personnel involved in all phases of the dry docking industry and acts as a consultant for ship repair companies.

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

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

## HPYD7

HPYD is the series of conferences on high-performance yacht design organised by the Royal Institution of Naval Architects NZ and the University of Auckland. The first

conference was held in December 2002. Since then, the conferences in 2006, 2008, 2012, 2015 and 2018 have showcased the latest developments in yacht research from around the globe. The conference enables naval architects, engineers, designers and researchers to present and hear papers on the current state of high performance yacht and power craft technology.

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

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

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

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

### 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. More information will be available soon, meanwhile put the dates in your diary now.

# NEWS FROM THE SECTIONS

## ACT

### Ship Vulnerability

Kathryn Dawes and Ian Leaver from the Naval Technical Bureau's (NTB) Vulnerability Cell gave a presentation on *Design Considerations for Reducing Ship Vulnerability to Military Loads* on 29 May. The NTB Vulnerability Cell has technical expertise across ballistic protection, blast hardening, integration of platform survivability, shock hardening, vulnerability modelling and analysis, and zoning, separation and redundancy requirements.

A ship's vulnerability is linked to the capacity to increase the survivability of the ship.

Ship survivability includes:

- reducing the ship's susceptibility (being targeted by weapons);
- reducing vulnerability by limiting the amount of damage caused if the ship is hit by a weapon;
- increasing the ship's recoverability from the damage impacts; and
- increasing the evacuation and rescue performance, as the last resort, if the ship platform cannot be saved.

Impacts caused to the ship and crew include flooding, explosion, smoke, hazardous gas and fire.

Flooding and recovery is addressed by specific design requirements for zoning, equipment separation and redundancy. This is assessed using specialist ship-modelling software. Examples from the modelling software were shown and the results discussed.

Explosions can impact both above and below the waterline.

Explosions below the waterline cause direct shock loads and hull girder whipping. Shock impacts on equipment and pipework via increased movement, material stress and collision impact due to equipment and system movement. The design process for shock-hardening equipment with specialist mounting systems was explained, including examples.

Explosions above the waterline include direct ballistic damage from weapons (direct impact/penetration and any secondary explosions which might be caused) and fragmentation. This raises the need to understand the potential weapon threats and the potential for multiple weapon hits and the spread of those hits. Design for venting of weapon blasts and the inclusion of ballistic protection of critical spaces is required. This can be achieved by either arranging critical compartments deep within the ship structure, or adding additional ballistic protection, but recognising the effects of additional mass of ballistic materials added high on the ship and its impact on stability.

The conclusion presented was that there are mature design solutions available, but that the key issue for the designer is to know the weapon threat, because it drives the design solution which needs to be incorporated into the platform.

### Interceptors and Trim Control

Dylan Van Drunen of the Civilian Engineering Development Program in the Naval Technical Bureau gave a presentation on *An Investigation into using Interceptors for Trim Control* on 3 July. Dylan completed his study at the Australian Maritime College in 2017 and the presentation was based on work undertaken as part of his final year thesis, *An Investigation into the Effect of Span on Interceptor Lift and Drag*.

Most high-speed planing craft require some form of trim control. Trim control allows a vessel's trim to be optimised, which lowers resistance by reducing transom immersion and giving a virtual reduction in displacement. This is especially important in the transition from the displacement regime to the planing regime. Methods of trim control include trim tabs, wedges and interceptors.

An interceptor is a form of trim control consisting of a thin blade protruding vertically below the transom.

This presentation discussed the behaviour of interceptors as they are deployed deeper (e.g. affecting laminar and turbulent boundary layers and the impact on drag), the

relationship between lift produced and interceptor span and, finally, relating these findings to practical boatbuilding.

This topic generated much discussion regarding how interceptors generate lift and the factors which might limit interceptor application. It was noted and concluded that, where the control forces were not large, interceptors were increasingly being adopted commercially due to their lower cost and simplicity when compared to more-traditional trim-tab systems.

*Ray Duggan*

## New South Wales

### Committee Meeting

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

- SMIX Bash 2018: *James Craig* venue has been booked and deposit paid; Organising Committee to meet; flyer to be completed and sponsors approached.
- Technical Meeting Program 2018: Re-arrangement of the schedule necessitated due to commitments of presenters; Sydney Mechanics School of Arts in Pitt St approached re use of venues.
- Members' Data Protection Security: Letter received from RINA HQ spelling out requirements for protection of members' data; queries raised on some issues and, as these affect all sections, questions to be asked via Australian Division.
- Walter Atkinson Award 2017–18: Two papers decided to be nominated for this award.

The next meeting of the NSW Section Committee is scheduled for 4 September 2018.

## Acquisition of MATV *Sycamore* for the RAN

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

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

The ship's primary role is to support maritime aviation training of Defence helicopter flight crews. The vessel is a flight-deck equipped sea-going training vessel for most types of helicopters used by the Australian Defence Force. She arrived in Sydney on 26 June 2017 and final acceptance by the Commonwealth as an Australian Maritime Safety Authority (AMSA) Special Purpose Ship was achieved on 28 July 2017. The Commonwealth has engaged Teekay Shipping (Australia) to crew, operate and maintain the vessel. Teekay established the required operating and safety certifications to enable the initial operational voyage on 4 August 2017.

MATV *Sycamore* is somewhat of an outlier within recent acquisitions being delivered "On Time, On Budget, and On Specification". The presentation briefly explored the underlying key features of the project, covering team characteristics, organisational structure, mission focus, communications and project strategies.

Alex's presentation is written up elsewhere in this issue of *The ANA*.

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

## Design and Construction of SilverYachts

Bernie O'Shea, Design Manager at SilverYachts, gave a presentation on *Design and Construction of SilverYachts* to a joint meeting with the IMarEST attended by 27 on 6 June in the Harricks Auditorium at Engineers Australia, Chatswood.

### Introduction

Bernie began his presentation with a short history of SilverYachts, which began life in 2002 as Hanseatic Marine, the brainchild of owner Guido Krass, a green-tech entrepreneur. He brought together the unique combination of a world-renowned yacht designer, Espen Øeino, and a production facility located in Henderson, WA, which has a reputation for producing the world's finest lightweight aluminium vessels.

Guido and Espen had a shared a vision to build custom superyachts that were the most efficient and of the highest distinction. The global search for a suitable shipyard quickly progressed to Australia where they could build a workforce which could meet all their exacting criteria. Many of the ex-Oceanfast employees were brought on as Oceanfast closed its operations, which added to the depth, capability and superyacht experience within the team.

In 2014, having successfully built the award-winning *Silver* series, Hanseatic Marine rebranded to SilverYachts in order to capture and reflect the successes of the company. The four world-touring yachts which have been launched to date are a testament to the professional talents of the company, boasting the highest level of performance, fuel efficiency, and Northern European luxury craftsmanship and outfitting.

SilverYachts revealed international expansion plans in 2017, with the second-largest global aluminium extrusion company, Zhongwang Holdings, joining the Australian boatbuilder as a majority share-holder. The deal will lead to the expansion of the superyacht range and build capacity in Perth as well as the opening of a new yard in China for building commercial and luxury vessels.

The superyachts are built for global cruising, ranging from the first, 73 m *Silver,* to the current 85 m, with the eventual aim of building a 100 m yacht at the Perth site.

The company employs about 150+ highly-qualified professionals on site and complete one vessel about every two-and-a-half years.

### The Yachts

Hull 1 at 73 m in length was the first vessel constructed by Hanseatic Marine and was named *Silver,* starting a line of vessels which commenced their names with "Silver. This vessel was launched in May 2007, and was owned for two years by Mr Krass, who used her for global cruising. When the next Silver vessel was launched, he sold *Silver* to the Abu Dhabi royal family, who changed her name to *Rabdan*.

The SilverYachts team in Perth
(Photo courtesy SilverYachts)

*Silver*
(Photo from SilverYachts website)

Hull 2 was also 73 m in length, named *Silver Zwei* and again used by Mr Krass until he sold her to a high-profile US technology billionaire, who changed her name to *Dragonfly* and uses her for extensive world-wide cruising.

*Silver Zwei*
(Photo courtesy SilverYachts)

Hull 3 was 77 m in length, launched in March 2012 and named *Smeralda*. She was an evolution of the first two, and was sold to the Dubai royal family.

*Smeralda*
(Photo courtesy SilverYachts)

Hull 4 was also 77 m in length, launched in March 2015 and named *Silver Fast*. The owner uses her for charter work in the Mediterranean summer, and world cruising at other times.

*Silver Fast*
(Photo courtesy SilverYachts)

Hull 5 is 85 m in length, is currently under construction with launching expected in early 2019, and will be named *Silver Loft.*

*Silver Loft*
(Photo courtesy SilverYachts)

A sistership to Hull 5 will begin construction shortly and plans for a larger vessel are on the drawing boards. [*Images of these planned vessels are available on the SilverYachts website* — Ed.]

Here Bernie showed a video of the interiors of the vessels, highlighting the high quality of the fitout.

**Covers and Awards**

SilverYachts does no advertising in Australia, but their vessels feature regularly on the covers of international yachting and boating journals, such as *Ocean, Boat International, Yachting and Style, Yachts, Luxury Toys, Boat, Yacht Design, ShowBoats, Exclusiv, Navis,* and *The Superyacht Report*.

In addition, their yachts have won many awards, including *Australian Superyacht Award 2008, ShowBoats Design Award, The World Superyacht Design Award 2013, International Yacht and Aviation Award 2013 and 2016, NYS Best New Yacht Award 2015,* and *ABIA Best Worldwide Custom built Yacht 2015*.

The vessels also hold some of the world's high-speed long-range records, including the 5000 n mile passage from Dubai to Singapore.

**Naval Architecture**

SilverYachts use both computational fluid dynamics and tank testing to optimise their hull forms. The hulls typically have a low draft to enable entry into some of the world's shallower ports and areas of the Caribbean, and are also optimised for high speed and efficiency. Tank-testing facilities which they use include the Maritime Research Institute Netherlands (MARIN) in the Netherlands, Statens Skeppsprovningsanstalt (SSPA) in Sweden, and the Krylov Shipbuilding Research Institute (KSRI) in Russia. The

efficiency of the hulls is shown, for example, by comparison of the top speed of *Silver Fast* of 27 kn with that of a competitor of the same length and power at 18 kn!

The software ANSYS is used for structural analysis and the vessels are designed for a Lloyd's Register service notation of G6 (unrestricted). All vessels are modelled in 3D using Pro-Engineer/Creo, and the software ANSYS is used for structural analysis. A high importance is placed on noise and vibration detailing throughout the design process. The first vessel, *Rabdan* (ex *Silver*) is 11 years old and hasn't experienced structural fatigue, noise or vibration issues.

Design and production have been optimised through the extensive use of aluminium extrusions. They concentrate on design for construction which helps to minimise the amount of fairing compound required to achieve the perfect surface finish which clients have come to expect.

Classification is achieved through rigorous design to the highest international standards, of SOLAS, LY3 (the UK's Large Commercial Yacht code) and PYC (the Passenger Yacht Code, developed by industry to enable larger vessels to carry up to 36 passengers without having to build to SOLAS), and to Lloyd's Register.

Their designs and builds have been independently surveyed by Patton Martine, internationally-renowned surveyors who work with other leading builders, e.g. Lürssen, Feadship, Blohm+Voss, Royal Huisman, Abeking & Rasmussen, and Perini Navi, among others. Comments have been exceptionally complimentary.

**Engineering**

SilverYachts uses internationally-renowned suppliers for equipment, so that reliability and availability of spare parts from international service networks is high. They are into product development, innovation, and advanced technology, but place a premium on minimal down-time, improved safety and maximum availability.

Here Bernie showed a fly-through of an engine room, and how the 3D model compared to the actual, finished engine-room layout, as well as some drawings of the various services on board one of the vessels.

Heating, ventilation and air conditioning is essential on a luxury yacht for the guests, the crew, and for the operation of all the equipment, especially in the equatorial areas frequented by these vessels. They look for continuous improvements by testing in extreme climates, upgrading capacity, system refinements, plant refinements, and building to the highest standard.

Software used includes Pro-Engineer/Creo and AutoCAD for drawing, MathCAD, etc. The data from the design is then fed directly into their purchasing, manufacturing, and planned maintenance of the vessels.

**Electrical**

Design and construction of electrical generation and distribution equipment aims for reliability, ease of operation and being globally serviceable. They provide extensive documentation, drawings, test reports and manuals.

Electronic ship systems include a full navigation and communication suite, which is remotely accessible at sea, closed-circuit TV and security, lighting control, and Apple audio-visual and information technology.

Electronic guest systems include a 10 kW external sound system, actuated and hidden TVs, lighting control, and Apple audio-visual and information technology. All these are fitted as late as possible during construction to obtain the latest technology.

**Outfitting Design**

Outfitting design is concentrated in three key areas, luxury outfitting, technical outfitting, and exterior outfitting.

Exterior design goes from concept to reality. The designer comes up with a sketch of an idea of what the exterior will look like. This is worked up into a 3D model for the client to discuss with the yard and modify as required, and progresses from there to working drawings for construction, on the basis of "luxurious simplicity".

Interior design also uses 3D modelling to optimise guest areas. All systems (electrical, HVAC, etc.) are run outside the space boundaries. Similar to the exterior design, the designer comes up with a sketch of an idea of what the interior will look like. This is worked up into a 3D model for the client to discuss with the yard and modify as required, and progresses from there to working drawings for construction.

Exterior styling is also done on the basis of 3D visualisation and rendering. The amount of design information required is very client specific.

**Production**

SilverYachts uses world-class fabrication techniques. Their workers need to understand aluminium and the effects of heat distortion, fatigue, etc., and great reliance is placed on the expertise of the production team. Materials are all CNC cut, and class approved. They use a system of module construction.

Production engineering software allows pipe bending and manufacture in-house, without having to send out to sub-contractors. The modelling side is all done using a 3D model, and able to turn layers on or off, so that the production team can see the layout on computers located around the production facility without having to go to the drawing office.

SilverYachts prides themselves on their fine furniture craftsmanship, and working through solutions together.

Fine furniture craftsmen at work
(Photo courtesy SilverYachts)

**Conclusion**

SilverYachts began life as Hanseatic Marine and has, so far, completed four luxury yachts, with a fifth due to be launched in early 2019. Three more vessels are in the design stage or about to start the construction phase. All are to the highest standards of design, construction and fitout. In aiming to meet the exacting standards set by Mr Krass, their vessels tend to advertise themselves as seen on the covers of international journals and the numerous awards they have won.

The vote of thanks was proposed, and the certificate and "thank you" bottle of wine presented, by Rob Tulk, who complimented Bernie that all this world-class design and construction was being done in Australia. The vote was carried with acclamation.

Rob Tulk (R) presenting the certificate and "thank you" bottle of wine to Bernie O'Shea
(Photo John Jeremy)

## Upgrade or Replace Warships

Alastair Cooper, of the Royal Australian Navy, gave a presentation on *Upgrade or Replace: A Cost Comparison of Australian Warship Service Lives* to a joint meeting with the IMarEST attended by 14 on 4 July in the Harricks Auditorium at Engineers Australia, Chatswood.

Alastair's presentation is written up elsewhere in this issue of *The ANA*.

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

## Recent Developments in Ocean Drones

Robert Dane, Chief Executive Officer at Ocius Technology, gave a presentation on *Recent Developments in Ocean Drones* to a joint meeting with the IMarEST attended by 26 on 1 August in the Harricks Auditorium at Engineers Australia, Chatswood.

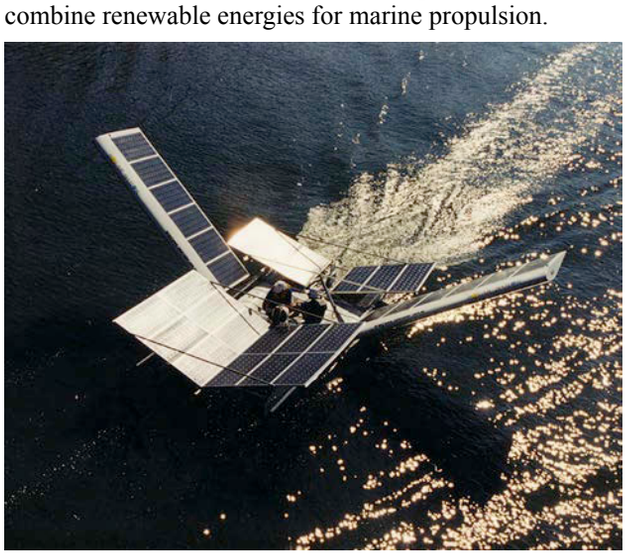
**Introduction**

Robert began his presentation with a short video which had appeared on the Channel 9 news last year, called *Making Waves*, as a brief outline of what ocean drones are (essentially autonomous unmanned surface vessels) and what they can do [*This video is available on the Ocius Technology website at https://ocius.com.au/news/blue-bottle/* —Ed.]

John Jeremy (L) presenting the certificate and "thank you" bottle of wine to Alastair Cooper
(Photo courtesy Graham Taylor)

**Ocius Technology**

Ocius Technology began life when Robert attended the Australian Technology Boat Race held on Lake Burley Griffin in Canberra in 1996, the race being won by the Incat Tasmania vessel. He wondered how to build a solar-powered vessel which could win the race. The next year he was back with a "solar sailor" prototype, *Marjorie K,* and won the race. In 2000 he founded Solar Sailor Holdings with a mission to combine renewable energies for marine propulsion.



*Marjorie K* at speed on Lake Burley Griffin
(Photo courtesy Ocius Technology)

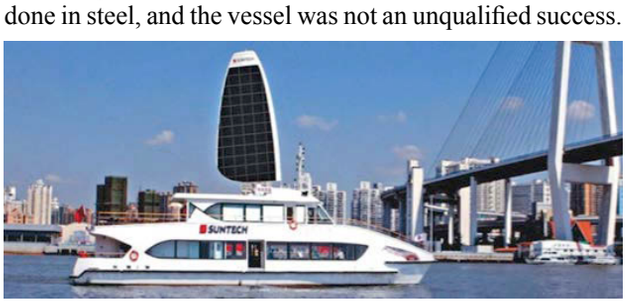
With support from family and friends, early investors and an Australian Greenhouse Office Federal Government grant, Solar Sailor built a 100 passenger tourist leisure ferry for Sydney Harbour, *Solar Sailor*. This innovative vessel, designed by Graham Parker, won the Australian Design Award of the Year in 2001 and was operated commercially by Captain Cook Cruises for over ten years, carrying tens of thousands of passengers. Following the sale of Captain Cook Cruises to Sealink in 2011, *Solar Sailor* operated commercially on Lake Macquarie as a charter and dolphin-watch vessel until sold in 2014 to a private buyer to convert into a houseboat at Brooklyn on the Hawkesbury River.

*Solar Sailor*
(Photo John Jeremy)

In July 2008, with oil at $140/barrel, the Hong Kong Jockey Club awarded a contract to Solar Sailor for the construction of four commuter ferries to operate a service to transport players, staff and supplies from the mainland the island of Kau Sai Chau where HKJC has three golf courses. Solar Sailor modelling predicted substantial savings in fuel consumption compared to the previous diesel ferry service, as well as reductions in emissions, and these have been achieved by the vessels *Solar Golf, Solar birdie, Solar Eagle* and *Solar Albatross*.

*Solar Albatross*
(Photo courtesy Ocius Technology)

After demonstration of the Sydney ferries *Solar Sailor* and *Majistic* to Suntech, a Wuxi-based solar panel company, in 2009 Solar Sailor was awarded a contract to design, build and install a 12 m high Solar Sail with software integration, on a 250 passenger VIP river cruise vessel, *Suntech Guoshung* for the World Expo 2010 in Shanghai. The vessel was designed in aluminium, but construction in China was done in steel, and the vessel was not an unqualified success.




*Suntech Guoshung*
(Photo courtesy Ocius Technology)

Solar Sailor continued development of the solar sail which could also be used to harness wind power, and ended up with their sails approved by DNV GL to 44 kn wind speed with a 100% margin of safety = 56 kn, with automatic stowing at 36 kn. The sails are also approved by NSW Roads and Maritime Services, and by the Hong Kong Marine Department.

A solar sail under construction
(Photo courtesy Ocius Technology)

**Hybrid Marine Power**

Hybrid marine power, which is a combination of diesel and electric — diesel for 15–18 kn speed and electric for 5 kn loitering, can be in either series or parallel. Series is more efficient but is heavier; parallel is less efficient but is lighter. Battery technology was previously limited to heavy lead-acid cells, but is improving all the time.

Among the benefits of hybrid marine power we can include the following:

- zero emissions at the wharf;
- fuel savings demonstrated in Hong Kong of 7–17% depending on duty cycle;
- guaranteed payback of capital investment;
- reduction in greenhouse gas and carbon emissions;
- reliability due to redundant systems being continuously backed up;
- very low noise;
- compatibility with future advances in battery cell technology; and
- approval by NSW and Hong Kong marine authorities

**Energy-efficient Shipping**

In 2009, Solar Sailor was asked by an Australian iron-ore exporter "How much energy from wind could be harnessed by a moving ship?" Solar Sailor analysed the world shipping routes, and looked at the global ocean wind power density as the seasons changed. Attending a conference with Richard Branson, NYK Shipping, Flettner Rotors, Wind Challenger, SkySails, Dyna Rig etc., all presenting to the industry, it became clear that renewable energy for shipping was limited by factors unrelated to the technology. Passenger cruise vessels don't like a list of more than 1.5°; tankers obtain their fuel for low cost; container vessels have limited deck space available for sails, etc.

Trends in shipping show that the world trade by ship is increasing, the cost of fuel is increasing but a price on carbon emissions didn't happen, regulations are increasing, and the cost of technology is decreasing all the time.

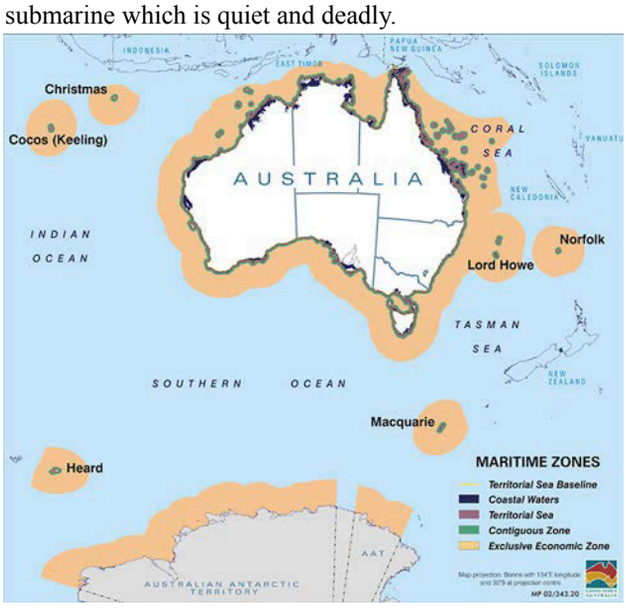
Solar Sailor commissioned a study by the University of Wollongong, where they analysed a route for a vessel between Port Hedland and Shanghai. The study started with 22 years of NASA satellite/buoy/ship cross-calibrated

ocean wind data at 10 m above sea level. The route was broken into 800+ sections, each of less than 14 n miles. The vessel was assumed to be travelling at 13.6 kn. Leaving on 1 July 1987, the energy saving of an entire voyage was calculated. Leaving on 2 July 1987, the energy saving of an entire voyage was calculated. This process was repeated for 8500 consecutive days (22.5 years) up to December 2010, providing an accurate historical mean of the energy and cost savings from sails on the modelled route. For every section of the voyage, the force generated by the sail was calculated incorporating the direction and magnitude of the wind from NASA data and the direction and speed of the ship, i.e. 'motor sailing'. Upwind and downwind was excluded from the study. The results showed double-digit savings, but they could not find anyone interested!

**Australia's EEZ**

Australia's Exclusive Economic Zone (EEZ) is one of the largest in the world, with a total marine area of around 10 million square kilometres, which is 30% larger than its total land area! Australia needs to protect its marine territory, but doesn't have enough resources to do so. 85% of Australia's trade comes by sea. We have 11% of the world's ocean area to protect, but only 0.3% of world's population to manage it.

It is much easier and cheaper to make incursions and attack vulnerable points or unmonitored areas than it is to monitor and defend the whole territory. Small boats can easily slip in and out of remote areas undetected. Submarines keep getting better and harder to detect, and more countries have them — 12 did during the Cold War, now over 40 do. $350 million will buy a good second-hand diesel-electric submarine which is quiet and deadly.




Australia's Exclusive Economic Zone
(Image courtesy Geoscience Australia)

**Unmanned Surface Vessels**

Unmanned surface vessels (USVs) can be powered by either fuel or renewable energy.

Fuel-powered vessels are often conventionally-powered vessels which have been made unmanned. Their maximum "on water" operations are limited, they do not provide continuous 100% coverage remote from the mainland, they are expensive to operate and support, and they are *noisy.*

Renewable-energy powered vessels, on the other hand, are persistent 24/7, they are quiet, and have low operational costs. However, they have low speed and manoeuvrability and may become stuck in currents. They are not totally seaworthy and able to advance in all conditions, carry only small payloads, and can only provide low power for those payloads. Despite the drawbacks, their advantages have been proven successful for oceanography, environmental assessment, and communications gateways.

**Development**

Following an enquiry from the USA in 2007 for a "self-sustaining platform at sea", Solar Sailor began research into the development of unmanned solar/wind/wave-powered and ballasted autonomous USVs. Initially, a 6 m manned engineering development model (EDM) proved the 'speed of advance' in all conditions, adequate power, payload and persistence for a sustainable platform able to go to sea for months.

In 2014, Solar Sailor changed its name to Ocius (Latin for "fleet") to reflect an expansion of its patented technologies including the solar sail. With Ulladulla Fibreglass and Engineering, Ocius built multiple scale models for tank and lake testing, culminating in the building of the first 3 m prototype, *Nemo* (Latin for "no one", i.e. unmanned) which provided significant proof-of-concept of a solar-, wind- and wave-powered USV carrying a significant payload. One of *Nemo's* achievements was finding the wreckage of an aeroplane on the seabed in Jervis Bay.

Over the subsequent seven years of research and development, the criteria have been

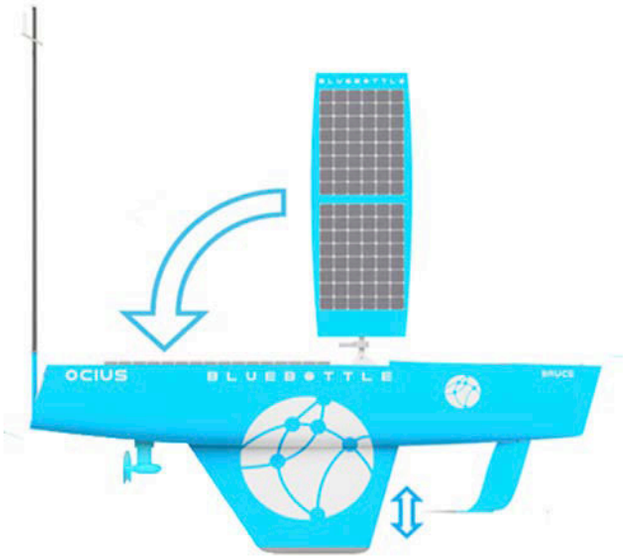
- seaworthiness, with the ability to advance in all conditions, get out of currents, and manoeuvre;
- payload to be at least 300 kg;
- power for the payload to be 50 W average 24/7 sustainably with 8 h sun (Darwin has an average of 11 h), with bursts up to 1 kW;
- the ability to be launched from a boat ramp or ship; and
- the ability to transport two in a 20 ft shipping container.

**Bluebottles**

Based on *Nemo*'s development, in 2015 Ocius was awarded a $3 million Capability Technology Demonstrator (CTD) grant from the Defence Science and Technology Group. This proved a significant contract and Ocius developed a 6 m prototype "bluebottle" (after the jellyfish which uses its body as a sail on the surface of the ocean), *Bruce,* for anti-submarine warfare which was demonstrated to the Royal Australian Navy in August 2017. The design is protected by six patent families worldwide and two registered designs in the USA.

Some of the features of *Bruce* include

- A communications mast at the aft end, 5 m above the water. A variety of sensors is already mounted and can be customised for any purpose.
- A solar sail which is built to collect sun and wind and to operate in all conditions. This is patented, and can securely stow onto the deck so that the bluebottle can continue on its mission under motor or wave power.
- A rudder-flipper appendage mechanism which can manoeuvre the vessel and facilitate forward motion through wave power via the pitching of the vessel.




Bluebottle *Bruce*
(Image courtesy Ocius Technology)

- A reel-in-keel cassette and winch which is able to deploy and retrieve 140 m of cable with any sensor, camera or ROV.
- Two bluebottle ocean drones can be fitted into a standard 20 ft container.
- Launch and recovery can be from a trailer at a boat ramp or by crane from on board ship, which is critical for navies.
- 5 kn hull speed under power.
- Low capital expenditure, and low operating expenditure, since there is no fuel and no crew required.
- No-one is placed in harm's way.
- The ability to monitor multiple platforms in a network.
- Full functionality up to Sea State 5, and survivability with some mission degradation up to Sea State 7.
- Can be used as an adjunct to manned and unmanned aircraft, manned ships and submarine operations.

Discriminators from the competition include more power, payload and performance, and having a speed of advance in all conditions.

*Bruce* on Sydney Harbour
(Photo courtesy Ocius Technology)

**CSIRO and Saildrones**

In the second quarter of 2017, CSIRO was looking for USVs to use in their own research programs. Then on 23 March 2018, CSIRO announced that it would be using three donated Saildrone USVs, manufactured by Saildrone Inc., based in Alameda, California, and having approximately $90 million in funding. Ocius was extremely disappointed that they were not given the opportunity to tender, as they consider that they have a significantly superior product for Australian conditions.

On 30 May 2018, the New Zealand Coastguard at Bluff Harbour rescued the sail which had broken off one of the Saildrones and, on 1 June 2018, another was towed into Port Macquarie with a broken aileron and a badly damaged sail. It is a competitive market out there, and the Saildrones are clearly not up to the job.

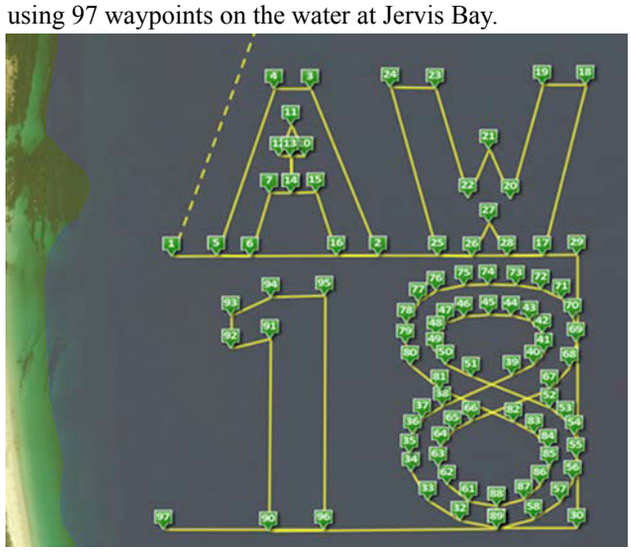

Saildrone
(Photo from ABC website)

**Bluebottle Trials**

Robert then showed some confidential slides [*which, for obvious reasons, we can't show here* – Ed.] from recent 'war games' trials on Jervis Bay between the 'five eyes' allies (i.e. Australia, New Zealand, USA, UK and Canada, where *Bruce* was asked to track the position of another vessel, which was also being tracked by GPS, and communicate the data to mission control and to seven other UAVs and USVs. *Bruce* nailed the position as exactly as the GPS, to big applause from everyone in the mission control room.

*Bruce* has echo-sounding equipment on board and is able to map the bathymetry of the sea-bed. This is a big advantage in that, if GPS and communications are both lost, depths can still be used to determine location.

Another demonstration of *Bruce's* ability was given by having the vessel trace out the letters and numbers AW/18 using 97 waypoints on the water at Jervis Bay.



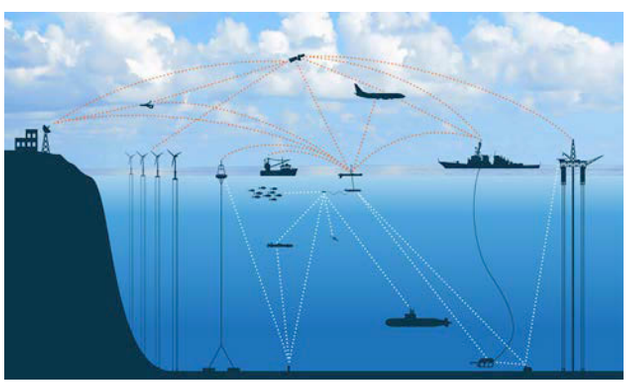
*Bruce*'s track with 97 waypoints on Jervis bay
(Image courtesy Ocius Technology)

The final war games will be in November this year, called Autonomous Warrior 2018, a multi-nation event to be held by Defence in November 2018 in Jervis Bay, New South Wales. It is a joint initiative of the Royal Australian Navy and the Chief Defence Scientist. Autonomous Warrior 2018 will involve three weeks of activities from 5 to 23 November 2018 at HMAS *Creswell*, Jervis Bay Airfield and associated sites, in Jervis Bay. There will be air, land, sea and subsea drones from all 'five eyes' countries participating, with all control systems talking to each other. *Bruce* is expected to perform well.

**Satellites of the Sea**

Ocean drones are the "satellites of the sea". They provide wide area continuous coverage, 27/7/365. They are autonomous, but have a human monitoring the loop—one person can control hundreds of USVs. There is no human error, and no-one, nor expensive assets, are placed in harm's way.

Boeing's vision, according to the Liquid Robotics (a Boeing company) website, is for a digital ocean, with a system of systems, all communicating with each other. Liquid Robotics manufactures the Wave Glider, a USV designed to harvest wave energy and capture data from the ocean.



Boeing's vision
(Image from Liquid Robotics website)

Ocius' vision is for, say, an intelligent command and control network of 300 bluebottles off the north-west coast of Australia, all acting independently, but reporting to one person who monitors for any anomalies or irregularities in the reported data, and can then alert other manned or unmanned vessels to assist or provide the required force.

Ocius' vision
(Image courtesy Ocius Technology)

The Wave Glider is proven technology, and can be used for oceanography, passive anti-submarine warfare and gateway communications.

In addition to those applications, bluebottles can also

- Undertake active anti-submarine warfare, as they have the "power to ping", i.e. they can actively ping their sonar to detect other vessels, as they are cheaper than the torpedo that would have to be fired to destroy them and, being so small and with low signature, would be hard to locate anyway.
- Act as leader of a group of unmanned underwater vessels UUVs).
- Act as "mother hen" for a UUV which would never need to surface; all it would require would be a winch with a special tow body.
- Lower a sensor to significant varying depths via a winch.
- Get out of currents, either in in high seas or the doldrums.
- Mimic other assets, e.g. the ability to play sounds like a much larger surface vessel or a submarine.
- Transmit an "answer" using on-board processing power.
- Undertake littoral/riverine operations, e.g. at night or with no sun, 12 h @ 4 kn gives a 48 n mile range.

**Unmanned Underwater Vessels**

UUVs are a well-known and mature technology with advantages including being able to avoid the weather, and stealth. However, they do have limitations, one being that, in avoiding the weather, they are unable to harness any of its power. Also, they can't access GPS, communications are difficult, and launch-and-recovery operations are difficult.

Pairing a UUV with a bluebottle USV using a tow body on a wire with a winch solves all of these limitations. This opens the way for research and development projects, and oil and gas applications.

**Defence Innovation Hub**

The Defence Innovation Hub is an initiative of the 2016 Defence Industry Policy Statement and will invest around $640 million over the decade to 2025–26 in maturing and further developing technologies which have moved from the early science stages into the engineering and development stages of the innovation process. It facilitates innovation activities from initial concept, through prototyping and integrated testing.

Some of the proposed hardware activities for the bluebottles in the next 12 months include:

- Building a 'next gen' bluebottle based on the lessons learnt from *Bruce*. This will be named *Bob* and christened by the Hon. Bob Hawke, retired Chairman of SolarSailor Holdings.
- Ocius is working with AMSA and Transport NSW to be given a non-exclusive 50 square mile area off Ulladulla, NSW, where the fishermen don't trawl due to the presence of an atoll which rises to a depth of 40 m in the surrounding water of 100 m depth for endurance testing of *Bruce* and *Bob* in ocean conditions. They have had conversations with the fishermen, and have advised that they will be able to map the depths around the atoll accurately, and allow them to trawl closer than they do now.
- A voyage from Sydney to Hobart.
- A voyage retracing that of Bass and Flinders in *Norfolk* in 1799 in which they set sail from Port Jackson, circumnavigated Tasmania anticlockwise and returned.
- A voyage around the world!

On the software front, there is much that can be done. Current naval command and control for intelligence, surveillance and reconnaissance by unmanned assets has one mission control centre communicating with each asset separately, and this does not scale with an increased number of vehicles. It also depends on reliable communications. The Ocius vision for this is that there would be a mission centre which would communicate with squad leaders who, in turn, would communicate with each other and with members of their own squad, and each of the squad members would also communicate with each other. This way, the mission is robust against degraded communications, and both individuals and the network react to the changing situation.

**Conclusion**

Ocius Technology has come a long way since the days of *Marjorie K* and *Solar Sailor*. They have developed the technology for capable autonomous unmanned surface vessels, and are busy demonstrating the capabilities and exploring the possibilities.

**Questions**

Question time elicited some further interesting points.

Ocius has considered the possibility of aerial drones (unmanned aerial vehicles or UAVs). These could always be deployed from a USV by way of a tether.

Defence has recently been tied up with the future submarines, future frigates, and future patrol vessels. Now that those projects are off the ground, they should have time to turn their attention to lower-budget items, such as ocean drones.

Ocius considers that they could have found Malaysian Airlines Flight MH370, given the funding. The point was made that the job remains incomplete!

Here Robert showed some videos:

- Testing of a model In a towing tank.
- *Bruce* tracing out the letters and numbers AW/18 on Jervis Bay.
- Collision-avoidance trials on Botany Bay:
  - A vessel crossing *Bruce*'s path at 20 kn, with *Bruce* altering course to pass behind the crossing vessel.
  - A vessel overtaking *Bruce* at 20 kn, with *Bruce* altering course to port.
  - A vessel meeting *Bruce* head on at 20 kn, with *Bruce* altering course to pass port-to-port.

The rules of the road at sea have been programmed in but, in general, *Bruce* takes action to avoid the other vessel.

[*These videos, and many more, are available on the Ocius Technology website at https://ocius.com.au/news/blue-bottle/* — Ed.]

The vote of thanks was proposed, and the certificate and "thank you" bottle of wine presented, by Martin Renilson, who said that it was great to see an Australian company leading the world's technology in this field. The vote was carried with acclamation.

*Phil Helmore*

Marttin Renilson (R) presenting the certificate and "thank you" bottle of wine to Robert Dane
(Photo Phil Helmore)

## LR's Online Tool to Help Evaluate Options for Sulphur 2020 Compliance

Lloyd's Register (LR) in May launched the *Sulphur 2020 — Options Evaluator* to help the industry identify the best strategy for compliance with the global sulphur in fuel oil limit of 0.50% m/m (mass percent concentration), which comes into effect on 1 January 2020. The Options Evaluator aims to bring some much-needed clarity to what the potential cost and investment implications could be for the various compliance strategies, such as transition from fuel oil to MGO, the use of scrubbers and HSFO, or the use of other compliant fuels such as LNG or methanol.

There is no clear strategy to achieve compliance. It is dependent on trading patterns, distance travelled, speed, size and type of vessels. The Options Evaluator allows ship operators to compare different compliance strategies by reviewing emissions output and comparing the different CAPEX and OPEX implications of each option.

LR's Douglas Raitt, Regional Consultancy Manager Asia, commented "2020 is around the corner and, to date, it appears that most operators will transition from fuel oil to gas oil operations to meet the global sulphur in fuel oil limit. Scrubber uptake or LNG and methanol as a marine fuel are slowly evolving, perhaps as a function of a 'wait and see' approach by the shipping industry. We developed the Options Evaluator to give some guidance to operators who have not yet fully considered their options for 2020 compliance."

Justin Murphy, CEO International Bunker Industry Association, said "IBIA is fully involved at IMO on all matters marine-fuel related and, for years, has been the voice of the industry pushing for practical regulations whichever options industry players choose. This options evaluator tool, one of a number being developed, is an aid which may complement owners' and operators' future efforts to develop a compliance strategy."

The *Sulphur 2020 – Options Evaluator* can be accessed at www.lr.org/en/sulphur-2020-options-evaluator

LR, *Press Release*, 15 May 2018

## New Guidance Relating to the BWM Convention

The IMO, at MEPC 71 (July 2017), agreed the following set of operational guidance documents and disseminated them as circulars and resolutions:

- Resolution MEPC.288(71) — 2017 *Guidelines for ballast water exchange* (G6)
- BWM.2/Circ.52/Rev.1 — *Guidance on entry or re-entry of ships into exclusive operation within waters under the jurisdiction of a single Party*
- BWM.2/Circ.62 — *Guidance on contingency measures under the BWM Convention*
- BWM.2/Circ.63 — *Application of the BWM Convention to ships operating solely in sea areas where ballast water exchange in accordance with regulation B-4.1 is not possible*

Resolution MEPC.288(71), which makes changes to the *Guidelines for ballast water exchange* (G6), does not necessitate the revision of existing on-board Ballast Water Management (BWM) Plans, because IMO has not revised the *Guidelines for ballast water management and development of ballast water management plans* (G4)' (Resolution MEPC.127(53)).

BWM.2/Circ.52/Rev.1 addresses single-voyage exemptions. While the BWM Convention provides for waivers to requirements for ships operating exclusively in a specified area, it does not address the situation for ships which have been granted such waivers, but need to undertake special voyages for periodic dry-docking repair or maintenance abroad, outside of the specified area. This circular provides guidance as to the short-term application of the Convention to such ships undertaking such voyages.

BWM.2/Circ.62 addresses the possible actions to be taken by the ship when discharged ballast water is found not to meet the necessary standard, which also requires liaison with the authorities involved. See also LR's *Class News* 09/2018.

BWM.2/Circ.63 clarifies that ships which do not yet have a Ballast Water Management System (BWMS), but are engaged in voyages where there is no suitable sea area for Ballast Water Exchange (BWE), are not required to install a BWMS until the date that a ship is required to meet D-2 standards. If the Port State has established a designated area for BWE, then other provisions apply. It is therefore essential to contact Port States on the establishment of such a BWE sea area.

Shipowners and ship managers are invited to bring the above information to the attention of ship masters. The above information may be included in the part of the shipboard Safety Management System, but is not required to be incorporated into the Ballast Water Management Plan at this stage. An updated version of the LR Model Ballast Water Management Plan can be found at https://www.lr.org/en/ballast-water-management/.

LR, *Class News*, 10/2018, 17 May 2018

## Bureau Veritas Issues New FSU Notations and Guidelines for the Conversion of Existing LNG Carriers to FSRUS/ FSUS

Bureau Veritas has issued new and updated notations and guidance to support the construction and operation of both Floating Storage and Regasification Units (FSRUs) and Floating Storage Units (FSUs).

Interest in FSRUs and FSUs is growing. Floating gas terminals offer operational flexibility, reduced timescales — from concept to operation, and cost effectiveness in comparison with onshore terminals. Additionally, converting existing LNG carriers offers a fast route to operational availability. There are more than 20 LNG carriers presently in laid-up condition. Many of them are candidates for conversion to floating terminal applications, such as FSRU or FSU operations. The new conversion guidelines provide clear advice to the LNG industry in properly addressing issues which either will or may arise during the conversion of LNG carriers into FSRUs or FSUs, helping shipowners to either avoid or to overcome potential problems.

Matthieu de Tugny, COO, Bureau Veritas, Marine & Offshore, said "With growing interest in floating gas terminals, working with industry stakeholders, we are providing the rule framework and guidance necessary to develop both FSRU and FSU terminals — both for newbuildings and conversions.

"Last November, Bureau Veritas published NR645, the first rules document fully dedicated to Floating Storage and Regasification Units. These new notations and guidelines are further evidence of BV's classification leadership in both FSRUs and FSUs."

*BV Press Release 30 July 2018*

## Approval Explorer — A New Search Engine from BV to Identify, Locate and Contact Certified Service Suppliers and Product Manufacturers

Bureau Veritas Marine & Offshore has launched the latest addition to their end-to-end and integrated platform of digital tools and services, Approval Explorer, a free and user-friendly web application available on any electronic device. The new Approval Explorer tool uses a powerful search engine, which allows all maritime stakeholders to identify, locate and contact Bureau Veritas-approved service suppliers or manufacturers, as well as search for certified products and materials, all around the world.

Approval Explorer will support the designer searching for specific equipment, the shipyard looking for the latest certified products, the flag authority willing to issue a list of certified service suppliers, and the ship manager arriving at a port and searching for the closest approved service suppliers.

Advanced features enable those users to search with keywords, create filters and favourites, and to export and share their findings. In addition, authenticated users will be able to download copies of certificates and search on the contents of those certificates, when made available by service suppliers and product manufacturers.

Laurent Hentges, Vice President, Operational Excellence, Marine & Offshore said "Approval Explorer is a tool which addresses the concrete needs of ship designers and ship owners, to makes life easier for our many clients and stakeholders. We wanted to make it functional, useful and accurate."

For more information visit https://approvalexplorer.bureauveritas.com.

*BV Press Release 21 June 2018*

## Bureau Veritas Issues Range of Approvals for GTT's New Gas Containment Systems and LNG Technology Applications

Bureau Veritas has issued a broad swathe of approvals to GTT (Gaztransport & Technigaz), expert in membrane containment systems and LNG technology applications.

Bureau Veritas experts have been working with GTT to approve two new containment systems: the Mark III Flex+, an evolution of the Mark III® but with a lower boil-off rate (BOR) and the GTT MARS™, a containment system developed for LPG carriers which is adaptable to any size of tank or ship.

Approval in Principle (AiP) has been provided for a 6500 $m^3$ bunker barge (jointly developed between DSEC and GTT) and the AiP for the design of an 180 000 $m^3$ LNG carrier is being finalised. Both demonstrate GTT's move beyond containment technology systems to full ship design.

Additional AiPs have been granted for:

- A solution for vapour pocket management allowing LNG carriers, in compliance with the revised IGC Code, to operate with an increased filling limit (above 98%).
- GTT's NO96 pressurization system evolution to provide enhanced maintenance flexibility and safety.
- Reduced cooling down features of both the NO96 and Mark III® systems to improve cargo operations.

Matthieu de Tugny, COO, Bureau Veritas Marine & Offshore, said "These approvals are helping GTT expand the range and depth of their technologies. The increasing sophistication of containment systems and expansion of their application — as in CMA CGM's breakthrough order for large containerships with membrane tanks — is driving the adoption and development of gas transportation and LNG as a marine fuel as well, supporting the marine gas trades."

Philippe Berterottière, Chairman and CEO, GTT, said "We are very pleased to be granted these approvals by Bureau Veritas with whom GTT has a very close partnership for decades. We have demonstrated the reliability of our latest developments and their ability to meet the owners' requirements. I believe these new systems and designs will help the shipping industry to move forward and reduce the ecological footprint."

*BV Press Release, 5 June 2018*

Workers inspecting the tank of an LNG carrier equipped with GTT Mark technology (Photo courtesy BV)

# FROM THE CROWS NEST

## World Water Speed Record

In 1977 Ken Warby broke the Outright Unlimited World Water Speed Record on Blowering Dam, NSW, with a speed of 464.5 km/h. Ken returned in 1978 to set his second and current record of 511.1 km/h, which to this day remains unbroken. Now, 40 years on from Ken's first world record, Warby Motorsport will again challenge for the Outright Unlimited World Water Speed Record, with a new boat and driver, *Spirit of Australia II* with Ken's son David driving.

Over the past 5 years the father-and-son team have been working side-by-side building the new *Spirit of Australia II*. The new boat is now completed, with successful testing undertaken in July 2017 at Taree, NSW, followed by two further weekends at the home of the World Water Speed Record, Blowering Dam, NSW. This allowed the team to test the boat at higher speeds on the 10 km long course in September and November 2017. The team conducted more tests on the Manning River at Taree in February, and again on Blowering Dam in late May this year.

Following successful testingof the most recent modifications to the boat on the Manning River at Taree, the team will return to Blowering Dam to push to higher speeds on the weekend of 1 and 2 September.

For more details, visit the Warby Motorsport website, http://warbymotorsport.com/.

David Warby piloting *Spirit of Australia II* on Blowering Dam
(Photo from Warby Motorsport website)

## *Bluebird* K7 Restoration

Donald Campbell's *Bluebird* has been fully restored by a team on Tyneside after she was discovered and then salvaged from Coniston Water in 2001. Campbell, the son of Sir Malcolm Campbell, was killed when *Bluebird* K7, travelling at more than 480 km/h, flipped and crashed on Coniston Water in 1967 while attempting to break his own world water speed record of 444.2 km/h.

The record-breaking hydroplane has arrived on the Isle of Bute in Scotland, where she will undergo tests, and took to the water for the first time in more than 50 years on 4 August.

Lead engineer of the North Shields project team, Bill Smith, said "We had five years of cataloguing everything that was salvaged, and then ten years of putting her back together. Every part has been cleaned and repaired. She looks absolutely beautiful now and she is how she should be."

After initial water tests are carried out in Scotland, it is expected that *Bluebird* will return to Coniston Water next year, where she will run at speed. "We'll be basically training ourselves on Loch Fad before Coniston because no-one really knows how she will handle", Smith added.

For more details, photos and videos, visit the Bluebird Project Twitter page,

#bluebirdonbute pic.twitter.com/3ThEdSe8aE

*Bluebird* on the water at the Isle of Bute, Scotland, on 4 August
(Photo from Bluebird Project Twitter page)

## Team Britannia

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

Construction of the vessel, named *Excalibur*, is proceeding, fuel tank installation is complete, the wheelhouse is taking shape, the FTP engines have arrived from Italy and have been tested, and the Centa couplings (to connect the engines to the Castoldi waterjets) have been installed.

An open day was held on Saturday 30 June for visitors to inspect the vessel, and around 150 people came from all over the UK and as far away as Scotland to visit *Excalibur* in her shed at ABC Marine on Hayling Island. They included partners and supporters, enjoying a close-up look at the boat and chatting to members of the crew, all in glorious sunshine, with the barbecue and bar kept pretty busy.

Alan Priddy now expects the vessel to be launched around the end of August. They will move the vessel to Gibraltar late in the year and, when the weather window is right, they will commence their round-the-world record attempt.

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

*Phil Helmore*

Wheelhouse interior on *Excalibur*
(Photo from Team Britannia Facebook website)

# GENERAL NEWS

## Australia's New Frigate Selected

On 29 June 2018 the Commonwealth Government announced the selection of BAE System's Global Combat Ship — Australia as the selected design for Australia's future frigates after an extensive selection process involving BAE Systems, Fincantieri and Navantia. These modern anti-submarine frigates will be based on the Type 26 Global Combat Ship currently under construction for the British Royal Navy.

Nine of the new frigates, designated Hunter Class, will be built in South Australia at the Osborne Naval Shipyard (now under construction) by ASC Shipbuilding. ASC Shipbuilding, currently wholly owned by the Commonwealth, will become a subsidiary of BAE Systems during the construction period. This is to ensure that BAE Systems is fully responsible and accountable for the delivery of the frigates.

The Commonwealth of Australia will retain a sovereign share in ASC Shipbuilding while BAE Systems manages the program. At the end of the program the Commonwealth will resume complete ownership of ASC Shipbuilding, thereby ensuring the retention in Australia of intellectual property, a highly-skilled workforce and the associated equipment.

The construction of the first of the new ships is scheduled to begin in 2020. The Hunter class will begin entering service in the late 2020s replacing the present fleet of eight Anzac-class frigates, the first of which, HMAS Anzac, entered service in 1996. All were built in Australia and have been updated through a series of modernisation programs. Some of the Anzac-class frigates will remain in service until the 2040s when the youngest of the class, HMAS Perth, will have been in service for more than 35 years.

The new Hunter-class frigates are intended to operate independently or in a national or coalition task group and will be equipped for a range of missions. The ships will, however, have a particular focus on anti-submarine warfare with an acoustically-quiet hull. The frigates will also have the flexibility to support non-warfare roles such as humanitarian assistance and disaster relief, and they will have sufficient range and endurance to operate throughout the Indo-Pacific region.

The Royal Navy plans to build eight Type 26 frigates and the first three, the future HM Ships Glasgow, Cardiff and Belfast are currently on order from BAE Systems in Scotland. The construction of the lead ship, Glasgow, began on 20 July 2017.

The Australian version of the Type 26 will be a large and flexible warship. The overall length will be 149.9 m, beam 20.8 m and maximum full load displacement 8800 t. The complement will be approximately 180 including the embarked helicopter flight, and accommodation and services will be provided for a maximum of 208 personnel.

The principal weapons and sensors in the Australian ships will be:

- The Australian CEAFAR2 phased-array radar.
- The Aegis combat management system with an Australian interface developed by Saab Australia.
- Electro-optic sensors.
- Ultra S2150 Hull-mounted sonar.
- Thales S2087 towed array and variable depth sonar system.
- Mk 41 vertical launch system with Standard Missile II (SM2) and Evolved Sea Sparrow Missiles (ESSM).
- Mk 45 Mod 4 127 mm medium gun, manufactured by BAE Systems.
- Two 20 mm close-in weapon systems.
- Two 30 mm short-range guns.
- MU90 torpedoes.
- Advanced anti-ship missiles.
- The Australian Nulka missile decoy system.
- Electronic countermeasures.

The ships will carry an embarked MH60R combat helicopter and the flight deck is large enough to accommodate a Chinook heavy-lift helicopter. A flexible mission bay in the superstructure approximately amidships will provide the capacity to embark containerised stores for humanitarian assistance and disaster relief, additional sea boats and will have capacity for unmanned systems and/or an additional helicopter.

The ship's navigation systems, internal and external communications systems and the various sensors and weapons and associated computer network will be integrated by the Aegis combat-management system.

Propulsion with be combined diesel-electric or gas (CODLOG). Two electric motors driving fixed-pitch propellers will power the ship. Four high-speed MTU diesel alternators will provide electric power for propulsion and ship services with one Rolls-Royce MT30 gas turbine to provide boost power for high speed. The top speed will be in excess of 27 kn and the range over 7000 n miles at cruising speed.

In Australian service these powerful warships will be known as the Hunter-class frigate. The first three will be named Flinders (after the South Australian region named for Captain Matthew Flinders, the first to circumnavigate Australia), Hunter (after the New South Wales region named after Vice Admiral John Hunter, the second Governor of NSW) and Tasman (after the state and sea named for the explorer Abel Tasman, the first known European explorer to reach the island of Tasmania, New Zealand and Fiji).

Profile impression of Australia's Hunter-class frigates
(Image courtesy Department of Defence)

NUSHIP *Sydney* was launched in Adelaide on 19 May and joined her sister ship *Brisbane* alongside at the Osborne Naval Shipyard — the last of the three air-warfare destroyers to be built by ASC Shipbuilding as part of the AWD Alliance team. *Sydney* will now complete fitting out and, after trials, is expected to join the RAN in 2020
(Photo courtesy AWD Alliance)

## Delivery of NUSHIP Brisbane

The Department of Defence Capability Acquisition and Sustainment Group accepted delivery of the second Hobart-class destroyer NUSHIP *Brisbane* at an official ceremony in Adelaide on Friday 27 July.

The ceremony, attended by Minister for Defence Industry, the Hon. Christopher Pyne MP, and the Chief of Navy, VADM Michael Noonan AO, included the presentation of the ship's bell rope and battle honour board to *Brisbane's* Commanding Officer, CMDR Josh Wilson.

Minister Pyne said that *Brisbane* is the second of three ships being delivered by the Air Warfare Destroyer Alliance.

*Brisbane* will enter into service later this year and with her sister ships, they will be the most potent warships ever operated by the Royal Australian Navy.

"By using a combination of Australian and globally proven technologies, these highly capable warships will contribute directly to our maritime security and allow us to work even closer with our allies."

Vice Admiral Noonan noted the significance of the occasion, for the Navy and Australia.

"This is major step in the construction of *Brisbane,* and she will be one of the most capable warships in the world, and it is a reflection of how Navy's modern warfighting has evolved." Vice Admiral Noonan said.

"She has the world's first complete combat-management system, which integrates powerful computers, radars and weapon systems to provide simultaneous defence against advanced air, surface and subsurface threats, allowing the Royal Australian Navy to think, fight and win."

This is the final milestone for *Brisbane,* and she will move from Adelaide to Sydney in September where she will be commissioned into service in October.

In April, *Brisbane* successfully completed her second phase of sea trials off the coast of South Australia. This phase of

trials, known as Category 5 (CAT 5) Sea Acceptance Trials, ran over a three-week period, and included some 30 platform tests and 38 combat system tests, comprising over 120 other test activities.

The Hobart-class destroyers will provide air defence for accompanying ships in addition to land forces and infrastructure in coastal areas, and for self-protection against missiles and aircraft.

## AWD Intellectual Property

The intellectual property for the Hobart-class family of warships has transferred to Navantia Australia, which ensures that Australia now has sovereign control over our air-warfare Destroyer (AWD) capability.

The Minister for Defence Industry, the Hon. Christopher Pyne MP, welcomed the transfer, which coincided with the successful launch and formal naming of the third and final destroyer, *Sydney*.

"*Sydney*'s float off reflects a remarkable 60 per cent productivity improvement over the first ship," Minister Pyne said.

"This is in no small way due to the highly-skilled workers from ASC, Raytheon Australia, Navantia Australia and Defence."

"More than 5000 people have worked directly on the AWD Program along with 1500 suppliers to build and integrate three of the most capable and potent warships the Royal Australian Navy has ever possessed."

## Osborne South Shipyard Well Underway

On 1 June 2018 the Minister for Defence Industry, the Hon, Christopher Pyne MP, and Senator the Hon. Mathias Cormann, said that just seven months after Australian Naval Infrastructure (ANI) engaged Lendlease as managing contractor, the redevelopment of the Osborne South Naval Shipyard is progressing well.

Minister Pyne said ANI estimated that the $535 million Osborne South redevelopment will create up to 600 jobs.

"Approximately 100 construction staff are currently working on site, and ANI estimates this number will peak at up to 400 in 2019," Minister Pyne said.

"Earthworks subcontractor, McMahon Services Australia, completed site preparation earthworks in early April 2018."

"McMahon and majority indigenous-owned subcontractor Intract Australia formed a joint venture to construct the early earthworks with Intract continuing to provide dust management on site."

"Piling contractor, Keller, mobilised in February 2018 and, as of late May 2018, over 2300 piles have been driven into the ground."

"This represents 48 per cent of the estimated 4800 total piles required for the Osborne South redevelopment."

"As piling is completed, concrete foundation works will commence by mid-year with more than 55 000 $m^3$ of concrete placed into the foundations."

Senator Cormann said that, in preparation for construction of the main fabrication and assembly halls, 100 per cent of the square-section structural steel has been ordered from Australian steelmakers Bluescope at Port Kembla, and Liberty OneSteel in Whyalla.

"During March 2018, steel deliveries to fabrication yards within Adelaide started, with pre-fabricated sections due to arrive on site from July 2018," said Senator Cormann.

"Above-ground structural erection work is scheduled to commence early in the fourth quarter of 2018."

"By tonnage, ANI estimates at least 75% of the steel used in the redevelopment will be Australian."

Development of the new shipbuilding infrastructure at Osborne South is scheduled to be complete in early 2020 to support the start of production for the first Hunter-class frigate.

## Western Australia to be Home of Hunter-class Training School

It was announced on 29 June that Western Australia will be home to a new Hunter-class frigate training and capability centre, known as 'Ship Zero', as part of a $670 million investment at HMAS *Stirling* and at Henderson to support Australia's new frigates.

The warships will be larger and have more-complex systems than the existing Anzac-class frigates, and will require new and upgraded facilities at HMAS *Stirling*.

As part of this $670 million investment, the Government will:

- extend the existing wharves;
- construct maintenance and equipment storage buildings;
- construct new support facilities, including medical facilities and accommodation; and
- construct a new Navy Training Systems Centre – West.

Ship Zero, located at both HMAS *Stirling* and at Henderson, will include a headquarters, through-life test centre, ship and capability specific training school and, potentially, a land-based test site for ship systems.

Ship Zero will transfer an increasing amount of the training, which has traditionally been done at sea, to land. This will mean that each of our new frigates will be able to spend more time on operations and exercising with our allies and partners, and less time in port for crew training.

Hunter-class frigate crew training will be based on a combination of classroom instruction, shore-based simulation, virtual-reality training systems and live training events ashore, centred at Ship Zero.

These upgrades to HMAS *Stirling* are in addition to the $300 million upgrades associated with the selection of *Stirling* as 'Ship Zero' for the offshore patrol vessels, the $150 million upgrades to support the new Maritime Operational Support Capability vessels and the $367 million redevelopment of HMAS *Stirling* infrastructure. This will bring total investment at HMAS *Stirling* to well over $1 billion.

The successful prime contractor will be required to implement a Local Industry Capability Plan (LICP) that will ensure small-to-medium businesses in Western Australia have the best opportunity to compete and win work on the infrastructure to support the Hunter-class frigates.

## Future Submarine Construction Yard Progress

**A** Development Application was submitted to the Port Adelaide Enfield Council at the end of July, for Phase 1 work on the Osborne North construction yard in South Australia.

Australian Naval Infrastructure (ANI) will oversee the delivery of a state-of-the-art construction yard where the RAN's 12 Future Submarines will be built.

"This is an important step towards the development of the yard and we are on schedule to turn the first sod later this year," said the Minister for Defence Industry, the Hon. Christopher Pyne MP.

KBR and Aurecon have been working with Naval Group to finalise the concept design of the yard, which will be owned by the Commonwealth as part of our national naval shipbuilding infrastructure."

ANI will shortly engage a managing contractor to oversee the continued design development and eventual build of the yard.

Phase 1 works will focus on site establishment, earth works and piling for the new facilities.

Due to the scale and complexity of the works required, the yard will developed in a staged approach.

"Development of the yard will deliver more opportunities for Australian industry to become involved in the Future Submarine Program," Minister Pyne said.

"We want as many local companies as possible to be involved in the yard's construction."

The Government is already investing $535 million in the Osborne South shipyard redevelopment where the future frigates are to be constructed.

## Garden Island Wharf Infrastructure Project

On 17 July the Minister for Defence, Senator the Hon. Marise Payne, and the Minister for Indigenous Affairs, Senator the Hon. Nigel Scullion, launched an Indigenous joint-venture to deliver the $213 million Bayinguwa critical wharf works project at the Garden Island Defence Precinct in Sydney.

The Bayinguwa Delivery Team is a joint venture between Pacific Services Group Holdings Pty Ltd (PSG Holdings) and Lendlease Engineering Pty Ltd. PSG Holdings, a small-to-medium enterprise which is 100% Indigenous owned and managed the design of the works. PSG Holdings has teamed with Lendlease for the construction of the works in a mutually-beneficial venture which gives this Indigenous business a foot-in-the-door to deliver major infrastructure projects.

"This project was announced by the Prime Minister in his 2018 Closing the Gap speech and, as he said, 'Bayinguwa' is the Aboriginal name for Garden Island in Sydney," Minister Payne said.

"The engagement of the Bayinguwa Delivery Team is first-and-foremost about delivering high-quality works for Garden Island. The Garden Island Bayinguwa Delivery Team will be responsible for managing the demolition of two deteriorated wharves and constructing a single new wharf in their place.

"These works are essential to ensure that the Royal Australian Navy can safely berth and maintain its ships at Garden Island, which is the major home-port on the east coast of Australia.

"By engaging an Indigenous joint venture to deliver these important works, the project will also support the Government's commitment to creating economic opportunities for Aboriginal and Torres Strait Islander businesses and growing the Indigenous business sector.

An impression of the new wharves at Garden Island in Sydney
(Image courtesy Department of Defence)

Minister Scullion heralded the announcement as yet another example of the practical measures the Government is taking to improve the lives of Indigenous Australians.

"The Indigenous Procurement Policy (IPP) has supercharged the Indigenous business sector, driving rapid growth in the demand for Indigenous goods and services across a diverse variety of industries. The IPP has resulted in more than 1000 Indigenous businesses across the country winning contracts

worth over $1.084 billion since the IPP's commencement in July 2015, up from just 30 Indigenous businesses winning $6.2 million in 2012–13 under the former Labor government's policies," Minister Scullion said.

The total project value is $213 million and construction is due to commence in September 2018 for completion in February 2022.

It is anticipated that the project will generate up to 150 jobs at the peak of construction with opportunities available for local industry and Indigenous involvement.

## Sonar Upgrade for Submarines

Australia's Collins-class submarines will receive significant sonar upgrades.

The Minister for Defence Industry, the Hon. Christopher Pyne MP, and Minister for Defence, Senator the Hon. Marise Payne, announced on 14 June that work will commence this year to enhance sonar systems across the Collins-class fleet.

This will better enable our submarines to safely navigate, detect and locate other vessels while remaining hidden themselves.

Minister Pyne said that the majority of the project being delivered by Australian industry demonstrates the maturity of the national submarine enterprise.

The project is valued at $542 million and the Australian Industry Content is approximately 70 per cent, creating more than 100 direct jobs.

51 jobs will be based in New South Wales, 25 in Western Australia, 21 in South Australia and 13 in the Australian Capital Territory.

Raytheon Australia and Thales Australia will play lead roles in delivering the sonar system upgrades, with ASC and a range of small-and-medium-sized Australian companies supporting system integration.

In the 2018–19 financial year, most of the spending will be on the design and production effort in NSW, with Raytheon Australia in Macquarie Park and Thales Australia in Rydalmere.

The upgrades will then be installed at maintenance facilities at Osborne in South Australia and Henderson in Western Australia.

## Novel Antifouling System

Light could hold the key to reducing operational costs for Defence and protect ships and the environment from marine pest invaders.

On 30 May the Minister for Defence Industry, the Hon. Christopher Pyne MP, announced that the Defence Science and Technology Group (DST Group) and the Australian Institute of Marine Science (AIMS) are researching a novel approach of using ultra-violet (UV) light to protect particularly sensitive areas on a ship's hull from biofouling.

"I welcome this collaboration to combat what is a major problem for the Royal Australian Navy and commercial shipping," Minister Pyne said.

Many different anti-biofouling technologies are used, but most are designed for temperate climates and do not perform well in Australia's tropical waters. Some can pollute the environment or have limited effect when the ship is stationary.

The five-year research project is aimed at experimenting with a number of advanced biofouling technologies, including the use of UV light.

One aim is to develop a camera housing that emits UV light from the surface. Researchers have found colonising organisms absorb UV light and are unable to replicate.

A team of Defence and AIMS scientists are now testing the technology in tropical waters at the AIMS research station near Townsville.

Minister Pyne said that initial results show the test surfaces to be free from fouling for prolonged periods, regardless of location or circumstances.

"The results look promising and will have wide ranging benefits for Defence, commercial shipping and the environment," Minister Pyne said

## Shipbuilding Plan Carries Extreme Risk According to ANAO

The Australian government's $89 billion program to develop new ships and submarines carries a high-to-extreme level of risk, the Australian National Audit Office (ANAO) warned in its recent audit of the program.

The shipbuilding program for the Royal Australian Navy (RAN) encompasses new submarines, major surface combatants and offshore patrol vessels.

The design-and-build milestones for the offshore patrol vessel were brought forward to help maintain the shipbuilding workforce from the end of the Hobart-class destroyer build to the start of the future frigate construction. As a consequence of the compressed schedule, Defence has carried several risks into the OPV acquisition.

As explained, the exact costs of the RAN's new OPV were not presented to the government at second-gate approval. In addition, commercial arrangements between the selected shipbuilder and Australian shipbuilding firms had not been settled when the tender outcome was announced.

"Over time, Defence has advised the Government of the high-to-extreme risks which the shipbuilding programs present. Certain risks are now being realised, including the progress of the offshore patrol vessel through second-gate approval without detailed sustainment costs and finalised commercial arrangements," the audit says.

The ANAO said that Defence is currently meeting scheduled milestones to deliver the abovementioned construction program, although each program is still at an early stage.

However, the audit identified issues that could occur in the future:

"Key risks relate to the delivery of expected capability, program cost, ability to meet program schedules, and management of the industrial base. The *Naval Shipbuilding Plan* did not address the management of these risks in any detail."

In case these risks are not managed appropriately, this could lead to the extension of service of the Armidale- and Anzac-class ships, and the Collins-class submarines, and the associated costs and effects on naval capability, according to the audit.

The audit also mentioned the accelerated schedule to enable

a 2020 construction start of the future frigate program. The audit warns that "schedule compression presented such extreme risk that cost and schedule overruns were likely" and that proceeding with the current schedule "had the potential for severe reputational damage to Defence and the Government."

## *Arunta* Upgrade Milestone for Frigates

The Warship Asset Management Agreement (WAMA) Alliance achieved a critical milestone in May with the removal of HMAS *Arunta's* mast during her Anzac Midlife Capability Assurance Program (AMCAP).

The mast removal was required to allow for the installation of a new radar system and was conducted at BAE Systems, Henderson, Western Australia.

WAMA Alliance Major Projects Implementation Manager, CMDR Steve Ford, said that the program would incorporate the SEA 1448 Phase 4B Air Search Radar, a replacement to the ageing SPS49 Long Range Air Search Radar. The new radar was developed by the Australian company, CEA Technologies, and complements the existing anti-ship missile defence system.

"Once operational, this system will provide increased capability and reliability, and lead to a significant reduction in through-life costs for the Anzac-class frigates," he said.

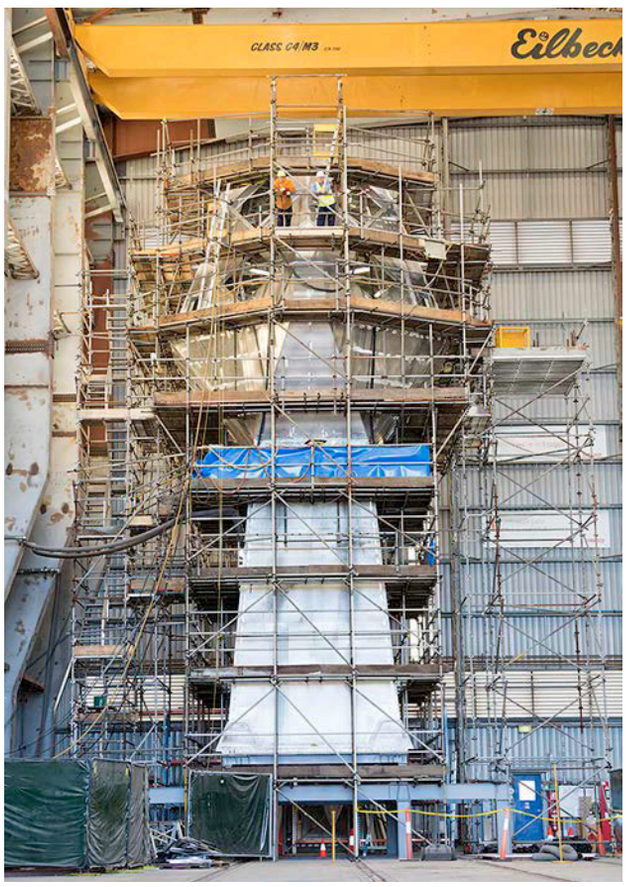
"The SEA1448 Phase 4B project will also replace the existing IFF (Identification, Friend or Foe) and secondary surveillance radar capability with a new and enhanced system."

During her time at Henderson, *Arunta* will also undergo a platform systems obsolescence program to improve platform reliability and maintainability. Work will also be done to improve the ship's habitability for the crew, while ensuring through-life supportability and reduced total cost of ownership into the future.

HMAS *Arunta* during her AMCAP upgrade at the Australian Marine Complex in Henderson, Western Australia (RAN photograph)

CMDR Ford said that the AMCAP period also included an upgrade to the ship's communications systems through SEA 1442 Phase 4, which will resolve a number of obsolescence issues that have arisen since the frigate was introduced in the late 1990s and early 2000s.

"This will result in significant improvements to the ship's integrated communications system, including tactical and secure communications," he said.



The mast of HMAS *Arunta* during modification (RAN photograph)

The WAMA Alliance is a strategic partnership between the Commonwealth of Australia, BAE Systems, SAAB Australia, and Naval Ship Management Australia to deliver total asset management of the Anzac-class frigates.

Its mission is to deliver materially seaworthy warships, driving long-term efficiencies to enable the Navy to fight and win at sea. After completing a successful initial 18-month program agreement, the WAMA Alliance recently entered into its second program agreement term for a period of five years.

*Arunta* is expected to be back in service towards the end of 2019 with the remaining seven ships to be completed by 2023.

## RAN Training Contract for ASC

The Department of Defence has re-engaged ASC Pty Ltd to continue to deliver the Royal Australian Navy's training services for the Collins-class submarine program.

On 10 August the Minister for Defence, Senator the Hon. Marise Payne, said that the contract ensures that all submarine crews will have the skills and knowledge to operate the Collins-class submarines safely and effectively.

"ASC has been a trusted partner for over 25 years in delivering submariner training at the Submarine Training and Systems Centre at HMAS *Stirling*," Minister Payne said.

"This important training continuum ensures that Australia's submarine capability is fully supported by a steady supply of highly-qualified personnel.

"ASC has proven their ability to deliver the required services and continue to innovate with Navy to develop and implement the latest in learner-centred training technologies.

"The advanced learning environment, including virtual reality and simulation, delivered by ASC provides submariners the skills and confidence to take on the demanding roles in a submarine."

The services include operator, maintainer and operational training for all submariners throughout their submarine career.

The contract is for an initial period of five years, with two possible extensions of three years each.

ASC has been an important part of readying Australia's submarine crews since the inception of the Collins-class submarine training program, training more than 1100 submariners since 1993.

## *Aurora Australis* Contract Extended

It was announced at the end of June that the contract of the icebreaker *Aurora Australis* has been extended, taking the ship's Antarctic service through to 2020 when Australia's new icebreaker is due to arrive in Hobart.

The existing contract between the Australian Antarctic Division and the ship's owner and operator, P&O Maritime, was due to end in March 2019.

*Aurora Australis* will resupply Australia's Antarctic stations in 2018–19 and now also in 2019–20.

*Aurora Australis* at work
(Photo by Wendy Piper, courtesy Australian Antarctic Division)

Australia's new state-of-the-art icebreaker, RSV *Nuyina* is due to arrive in its home port of Hobart in mid-2020 and begin its Antarctic service in the 2020–21 summer season.

The Director of the Australian Antarctic Division, Dr Nick Gales, said that he was pleased that *Aurora Australis* was able to participate in an additional Antarctic season.

"*Aurora Australis* has crossed the Southern Ocean in support of science and to resupply our stations since 1989 and we're pleased that the ship can continue to service the program until Australia's new icebreaker arrives in Hobart," Dr Gales said.

P&O Maritime's Managing Director, Rado Antolovic, said that his company was delighted to renew the contract which underlines the long-standing partnership with the Australian Antarctic Division.

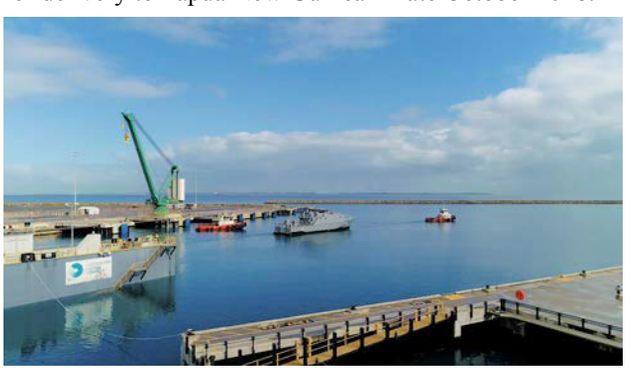
"*Aurora Australis* is part of our fleet of over 300 vessels providing a wide range of services for governments and customers around the world, from tugs and pilot boats to river barging and research vessels such as this.

"We look forward to supporting the Australian Antarctic Division in its important research work for the benefit of the environment and our planet."

The stern module of RSV *Nuyina*
(Photo by Michiel Jordaan, courtesy Australian Antarctic Division)

## Progress with Pacific Patrol Boat Project

On 30 May Austal launched the first of 21 Guardian-class, Pacific Patrol Boats (PPB-R). The first vessel, which began sea trials on 9 August (Austal's 30th birthday), is scheduled for delivery to Papua New Guinea in late October 2018.



The first of the Pacific Patrol Boats was launched using the floating dock at the Common User Facility of the Australian Marine Complex at Henderson, Western Australia
(Photo courtesy Austal)


Arrival of the first PPB-R at Austal's Henderson shipyard after launching
(Photo courtesy Austal)

"Austal is proud to be delivering the PPB-R program for the Commonwealth. This is the first steel ship program we have managed and we are doing so on time and on budget" Austal CEO, David Singleton, said.

"The overall construction program is well underway with vessels two and three in build and the fourth vessel commencing construction in June."

"This program will support 200 direct jobs at Austal and a further 200 indirect jobs in the broader Australian industry in a program which now extends out to late 2023. This employment is in addition to several hundred jobs at Austal created by a number of large commercial export contracts currently under construction and planned for construction at our Henderson shipyard."

The Pacific Patrol Boat contract was awarded to Austal in May 2016 and worth $305 million for the original 19 vessels and associated in service support, with a further contract awarded in April 2018 for two additional vessels for $29.7 million.

## Commercial Shipbuilding Expansion for Austal

In May Austal announced that it has finalised the details of its investment of up to $US30 million for capacity expansion focused in the company's commercial shipbuilding facilities in Western Australia and Asia.

Austal first noted potential plans to expand its existing commercial shipbuilding facilities in mid-2017, following a significant increase in its order book at that time.

The works are expected to be completed during 2018 at Henderson and in early 2019 in the Philippines.

Austal CEO, David Singleton, said that the investment was primarily focused on the large ferry market where Austal holds a competitive advantage through its advanced design of high-speed vessels, and modular construction approach.

"The capital investment in the commercial operation will increase Austal's ability to secure and deliver large high-speed aluminium vessel contracts in highly cost-effective shipyards," Mr Singleton said.

"The demand outlook in the market for large high-speed aluminium vessels underpins Austal's decision to focus its investment in this sector."

**Henderson, Western Australia**

Austal's Henderson operation is constructing a $100 million, 109 m high-speed catamaran ferry for Mols Lines of Denmark and the first of two, 117 m trimarans for Fred Olsen Lines, worth a combined $190 million, destined for the Canary Islands.

The $A6 million capital investment to upgrade the facilities at Henderson will include enhanced launch facilities to support large vessel construction and infrastructure upgrades to support improved efficiency across the operations.

The investment is in addition to last year's expansion of capacity with the establishment of a Pacific Patrol Boat shipyard at a new facility in Naval Base. This facility is primarily focused on steel ship construction and will deliver the first of 21 vessels later this year. Production of the last vessel is due for completion in 2024 under construction and sustainment contracts worth approximately $335 million.

**Cebu, Philippines**

Austal will invest about $US18 million to more than double the capacity of its existing Philippines shipyard. The upgrades to the facilities will include a new assembly hall which will be 120 m long, 40 m wide, and 42 m high. This will enable the shipyard to assemble the largest commercial vessels, based on Austal's existing order book and tender pipeline.

The facility upgrades will also include additional assembly bays, material storage and accommodation facilities to allow the workload at the site to increase to more than twice its historic peak. These facilities are due for successive completion through 2018, with all construction complete by early 2019.

Mr Singleton said that the new assembly hall would enable Austal to construct two large (100+ m long) vessels in parallel in Henderson and the Philippines.

Austal Philippines currently has in production:

- One 109 m high-speed catamaran for Fjordline of Norway, worth $108 million.
- Two 50 m high-speed vessels for Braveline (a subsidiary of Wisdom Marine), worth $44 million.
- One 49 m vessel for SNC Aremiti, worth $30 million.
- One 30 m vessel for VS Grand Tours, worth $5 million.

As a result of the increased investment it is expected that revenue in Cebu will double in FY19 and FY20, compared to the recent average.

**Vung Tau, Vietnam**

In addition to the investment outlined above, Austal has recently commenced a small commercial shipyard operation in Vietnam. The new location is located in the highly industrialised shipbuilding and marine support precinct to the south of Ho Chi Minh City. The location was selected to provide additional high-quality aluminium construction support to Austal's commercial operations both for modules for larger ships (supporting Austal Philippines) and to build smaller high-speed aluminium vessels.

Austal Vietnam operations are operating in a leased facility requiring only minimal capital investment. The operations are currently completing registration and qualification from both the Vietnam authorities and from DNV GL classification society.

Vietnam was selected for this expansion due to the immediate availability of a highly-experienced management team and support personnel. Several of the senior personnel in the new operations were originally Austal trained and have extensive and successful experience in high-quality aluminium shipbuilding.

## Austal-built LCS Completes Acceptance Trials

On 1 August the ninth Independence-class Littoral Combat Ship (LCS) completed acceptance trials in the Gulf of Mexico. The future USS *Charleston* (LCS18) will be the third LCS which Austal has delivered to the US Navy in 2018.

The completion of acceptance trials is the last major milestone required by the US Navy before the ship is delivered and commissioned into service. The trial involves the execution of intensive and comprehensive tests by the Austal-led industry team to demonstrate to the Navy the successful operation of the ship's major systems and equipment.

"Austal USA delivered LCS 14 to the Navy at the end of February, LCS 16 at the end of April and will deliver

*Charleston* (LCS18) during launching operations at Austal USA's Mobile, Alabama, shipyard in September 2017. *Tulsa* (LCS16) lies alongside fitting out
(Image courtesy Austal)

*Charleston* in the next couple of months. Moving these ships out to the fleet in such rapid succession is a huge accomplishment for our Mobile team and a testament to the supply chain supporting the LCS Program" CEO David Singleton said.

Of the eight Independence-variant LCS that Austal has delivered, six are currently homeported at the San Diego Navy Base. The LCS program is at full-rate production with several ships currently under construction. *Cincinnati* (LCS 20) is preparing for sea trials. Final assembly is well underway on *Kansas City* (LCS 22) and *Oakland* (LCS 24). Modules for *Mobile* (LCS 26) and *Savannah* (LCS 28) are under construction in the module manufacturing facility and *Canberra* (LCS 30) is in pre-production.

## Austal Awarded Contract for LCS Design Services

On 26 June Austal announced that the United States Department of Defense has awarded Austal USA $US16.3 million extension to a previously awarded cost-plus-fixed fee contract.

The order provides for Littoral Combat Ship class design service, including integrated data and product model environment (IDPME) support. Austal will provide class design products including technical analyses, engineering, configuration management, software maintenance and development, production assessment, diminishing manufacturing sources and sea-frame reliability analysis.

The work will be conducted by Austal USA across the Mobile, Alabama and Pittsfield, Massachusetts facilities for completion by June 2019.

"The LCS has a significant economic footprint in the United States, supporting tens of thousands of jobs through the contributions of more than 900 local suppliers in 41 states involved in the program," Austal CEO, David Singleton, said.

## Norship Marine Completes RFNS *Kikau* Refit

On 24 July, the 31.5 m Pacific Patrol Boat (PPB) RFNS *Kikau* was formally handed over to the Republic of Fiji Military Forces (RFMF) Naval Unit after undergoing an extensive refit at Norship Marine's facility in Cairns, Far North Queensland. The vessel was built by ASI and commissioned into service circa 1995. *Kikau* returned to Australia on board *Thorco Isadora* from Suva, Fiji in early 2017 to undergo refit and upgrade as part of the Commonwealth of Australia's continuing support of the Defence Cooperation Program — South Pacific. Norship Marine has provided In-Service Support (ISS) for the 21 existing PPBs operated by 12 Pacific Island Nations since July 2017 and well prior to winning the ISS contract as the preferred shipyard for the fleet's third refit program.


*Kikau* arriving in Cairns
(Photo courtesy Norship Marine)

The *Kikau* refit project introduced some unique challenges for Norship's engineers and tradesmen, given that the vessel had not undergone major maintenance and repairs for over 15 years. Upon arrival the vessel was found to contain


*Kikau* returning to the water after her refit
(Photo courtesy Norship Marine)

virtually no installed systems, with those remaining heavily cannibalised, and a large proportion of the hull structure had severe corrosion and damage issues. This resulted in the replacement of more than half the hull structure and the implementation of wide-spread structural and systems upgrades to re-establish a clearly defined and supportable configuration baseline, and ensure uniformity with the remainder of the fleet. The end result is the return of a mission-capable vessel which will significantly improve the capability of the Fijian Navy to patrol their exclusive economic zone.

The multi-million dollar project required in excess of 80 000 shipyard labour hours to deliver, with additional support provided by Norship's technical support network — comprising local Australian skilled and experienced subcontractors and suppliers. The *Kikau* refit project was the largest and most extensive refurbishment program ever undertaken on a PPB-class vessel, which further demonstrated Northern Australia's capability to deliver high-end complex Defence support and sustainment programs.

The ship is scheduled to participate in exercises with the Royal Australian Navy for the next two months before proceeding home to recommence patrolling the territorial waters of the Fiji islands.


*Kikau* departing after her major refit
(Photo courtesy Norship Marine)

## Austal Cape-class Patrol Boats for Trinidad and Tobago

On 30 July Austal advised that the Government of the Republic of Trinidad and Tobago (GORTT) had announced its intention to purchase two Austal-built Cape-class patrol boats. The vessels will enhance the border protection capabilities of the country in conjunction with the existing Coast Guard fleet, and will join six Austal fast patrol craft acquired in 2009.

This announcement follows a comprehensive proposal submitted by Austal to GORTT. The sale is likely to be supported by the Australian Government via the Export Finance and Insurance Corporation (EFIC), and follows a demonstration by the Royal Australian Navy (RAN) of the capabilities of the Cape-class vessel to a delegation of senior Trinidad and Tobago officials, which included the Chief of Defence Staff.

The order is likely to be valued at circa $100 million, plus a multi-year ongoing maintenance-and-support package. Austal expects to establish a Service Centre in Trinidad to support these vessels, the Austal supplied fast patrol craft, and any additional vessels requiring maintenance as determined by GORTT.

The new Cape-class vessels will be built in Austal's Henderson shipyard. Austal has already built 10 Cape-class vessels at Henderson for the Australian Border Force and RAN. Delivery is expected to be in mid-2020.


An impression of the Cape-class patrol boat for Trinidad and Tobago Coast Guard
(Image courtesy Austal)

Designed and built by Austal, the Cape-class is a 58 m all-aluminium monohull patrol boat specifically produced to combat the full range of maritime security threats. The vessel has a long 4000 n mile range and 28-day patrol cycle with a crew of up to 22. The vessel also supports two high-speed 7.3 m rigid-hull inflatable boats used for intercepting other vessels.

GORTT have requested that the purchase be supported by an EFIC finance package which will be developed specifically to support the program, for which EFIC have already supplied a letter of support. The sale of the vessels is conditional on final contracts being signed in the coming weeks, together with a conclusive offer from EFIC to GORTT. It is expected that an initial lower-value design contract will be signed shortly to hasten preparations for the main contract and ensure that the delivery schedule will be maintained.

These vessels will be the latest additions to the work already scheduled in the Henderson facility, including a 109 m catamaran for Molslinjen of Denmark, 21 Pacific Patrol Boats currently under construction and a 117 m trimaran for Fred Olsen SA of the Canary Islands which will commence construction in August 2018. These additional build programs will keep the local workforce active at the current level until 2021 (2023 for PPB), one of the longest forward order books seen at Austal for a decade or more.

## Sydney Ferry Launched At Incat

On 10 July Incat Tasmania launched hull number 092, a 33 m commuter passenger vessel built for Manly Fast Ferries.

Hull 092 bearing the 'My Fast Ferry' livery will soon join four other Incat built vessels in the My Fast Ferry fleet in Sydney on harbour commuter service.

The ferry has been under construction at Incat since late 2017, with a team at Incat working on day and afternoon shifts to construct and fitout the vessel.

The ferry has capacity for 400 persons. My Fast Ferries Chief Operating Officer, Will Ford, said "With a service speed of just under 25 kn the new craft will no doubt be as popular as those Incat vessels which have already joined the Manly fleet."

NRMA Chief Investment Officer, Rachel Wiseman, officially named the vessel *Ocean Adventurer* with the traditional breaking of a champagne bottle across her bow.

Manly Fast Ferries was purchased in early 2018 by the NRMA who now market the service with the 'My Fast Ferry' branding.

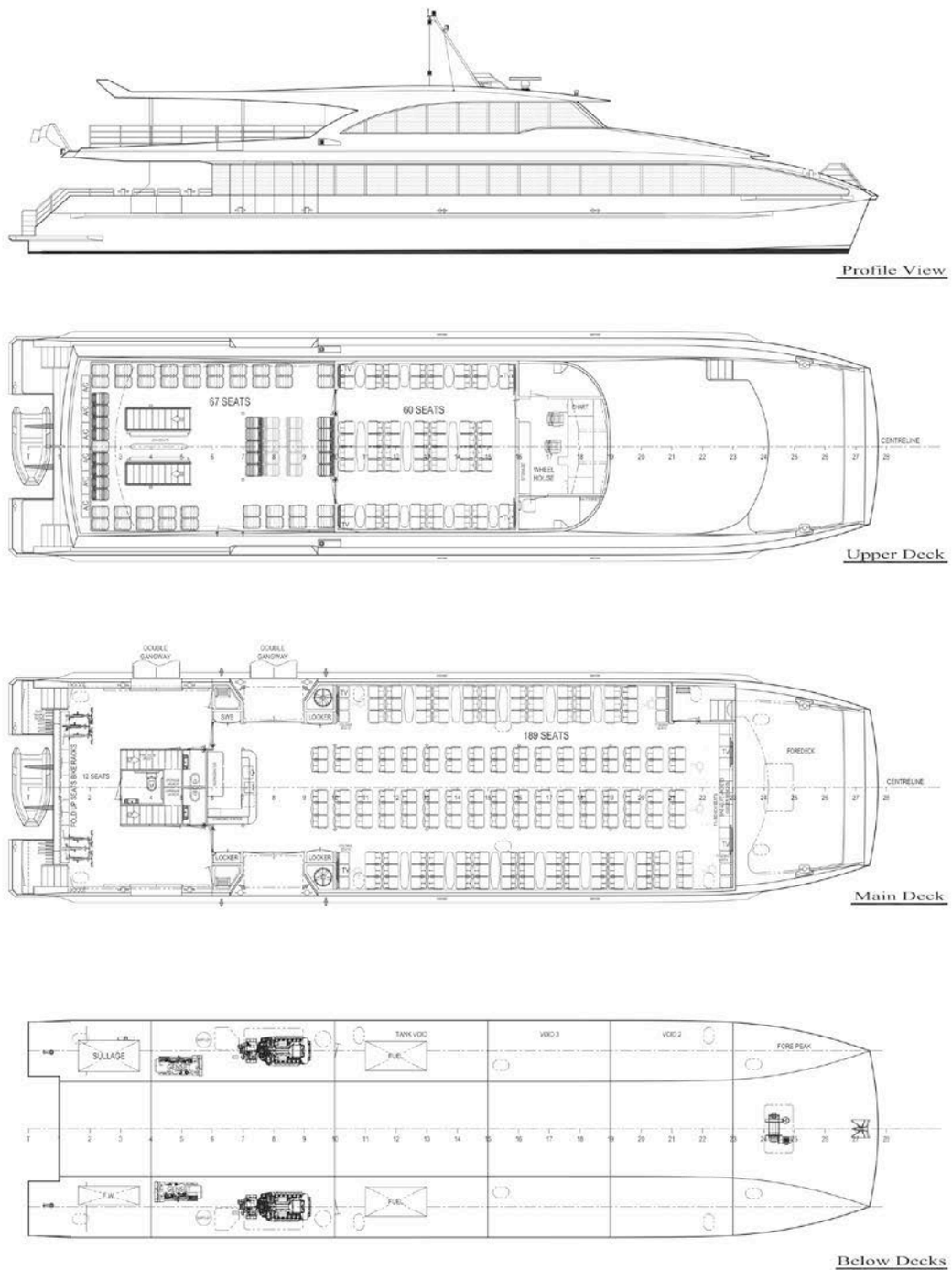
Incat Chairman, Robert Clifford, will conduct sea trials of the vessel over the next week. Robert Clifford said "It is good to see another Incat ship heading for operation in Australian waters. Our workforce is busy with the next couple of years' production at Incat focussed on large vehicle and passenger ships for overseas clients."

*Ocean Adventurer* is constructed of aluminium.

**General Particulars**

| | |
|---|---|
| Designer | One2three Naval Architects |
| Survey | AMSA |
| Code | NSCV Class 1C and 1D |
| Speed (service) | 24.9 kn |
| **Principal Dimensions** | |
| Length OA | 34.14 m |
| Length WL | 32.19 m |
| Beam OA | 9.00 m |
| Beam moulded | 8.50 m |
| Depth moulded | 2.70 m |
| Draft hull | 1.36 m |
| Draft extreme | 1.85 m |
| **Capacities** | |
| Passengers | 396 (1D) 256 (1C) |
| Crew | 4 |
| Fuel | 2 × 2500 L |
| Fresh Water | 1 × 1000 L |
| Sullage | 1 × 2780 L |
| **Machinery** | |
| Main Engines | 2 × MAN D2862 LE463 each 1029 BkW at 2100 rpm |
| Gearboxes | 2 × Twin Disc Quickshift MGX6620 |
| Propellers | 2 × fixed pitch 5 bladed |

*Ocean Adventurer* rolling into the water at her launching in Hobart on 10 July
(Photo courtesy Incat Tasmania)




General Arrangement of *Ocean Adventurer*
(Drawing by One2three Naval Architects, courtesy Incat Tasmania)


*Ocean Adventurer* afloat
(Photo courtesy Incat Tasmania)

*Gallina* alongside *Prelude*
(Photo courtesy Shell Australia)

## *Prelude* Receives Hydrocarbons for the First Time

In June Shell's Prelude FLNG Facility reached a significant milestone, with gas introduced onboard. Gallina, an LNG Carrier from Singapore, carried out the transfer.

This is a first for Prelude, and an opportunity to test processes and systems before the subsea wells are opened at start-up.

It's the first time a vessel has berthed side by side with Prelude and tested its offloading arms, in reverse order to how this will work once Prelude is operational. Prelude's offloading arms have been specifically designed to ensure safe offloading while both the facility and Gallina are moving. In this case, the offloading arms transferred the LNG from Gallina to Prelude.

Once onboard, the LNG makes its way through process equipment and pipework and is stored within tanks in the hull of the facility. These tanks have been designed to withstand the 'sloshing' of the product which could happen due to the movement of Prelude. Four of the huge LNG tanks, at 39 000 $m^3$ each, are now full.

With gas onboard, Prelude's utilities can now switch to run on gas rather than diesel.

Shell's Vice President Prelude, David Bird, is excited to reach this milestone but remains focused on the end goal. "It's important that we take a moment to celebrate and recognise this achievement," he said.

"It's equally important that we don't lose sight of the end goal — the safe and reliable start-up of our incredible asset, Prelude, and the delivery of gas to our customers."

Prelude Project Director, Didrik Reymert, stressed the importance of safety now that the facility is 'live'.

"The risk profile of the facility has changed fundamentally and this has a great impact on how we work," he said. "Now, more than ever, we must maintain our unrelenting focus on the safety of our people and our environment.

"Introducing gas onto Prelude is an important step towards start-up but there is a lot of work to do before we get there.

The next step will be to test and ready the LNG plant on board Prelude in preparation for opening the wells. This is followed by a period called start-up, ramp-up. LNG will be produced after this, when it is safe to do so.

## *Spirit of the Wild* from Incat Crowther

Incat Crowther has announced the launch of Spirit of the Wild, a spectacular new tour vessel for Gordon River Cruises, and the first in Australia to operate in World Heritage-listed wilderness with Silent Drive. Offering interpretive tours into the heart of the UNESCO Tasmanian Wilderness World Heritage Area, Spirit of the Wild will give customers a unique natural experience.

Built by Richardson Devine Marine in Hobart, Spirit of the Wild is fitted with a pair of MTU 10V2000M72 main engines. Added to this is a cutting-edge hybrid electric system, consisting of a pair of ABB e-motors, driving hybrid-ready ZF gearboxes. Particular attention was given to the mounting of the engines and gears to reduce the transmission of vibration and noise. The main engines' modest rating is tailored to the local crewing requirements. In open water, the vessel will use boost mode from the hybrid system, which matches motor speed to engine speed to seamlessly add electric power. In this mode, the vessel operates at 25 kn. When the vessel comes to the World Heritage-listed Gordon River, Silent Drive mode is engaged. In this mode, the main engines are shut down and the vessel runs on electric power.

Spirit of the Wild exhibits excellent noise and vibration characteristics, even in boost mode. Engine ventilation systems and the engine room were addressed with a fully-engineered acoustic insulation system. Attention was paid to fittings and door openings, with seals and bushes used extensively to stop rattles and gaps. In Silent Drive mode, the experience is eerily quiet, with seats returning sound level readings as low as 45 dbA.

Incat Crowther developed a vessel which utilises triangular

Port Side of *Spirit of the Wild*
(Photo courtesy Incat Crowther)

Seats and triangular windows on *Spirit of the Wild*
(Photo courtesy Incat Crowther)

Food service area on *Spirit of the Wild*
(Photo courtesy Incat Crowther)

side structure to enlarge openings and minimise obstructed viewing locations, wrapped in a stealth-like exterior design. Dark reflective floor-to-ceiling glass provides an unparalleled viewing experience and enables the vessel to 'disappear' into a backdrop of tannin-coloured water and ancient wilderness forest.

The vessel layout is designed around optimal viewing. Every seat on the vessel was considered in the design to provide exceptional vistas.

Service areas are located in the centre of the vessel. The main-deck side boarding areas, involving engine room ventilation and engine removal, were minimised, whilst the main staircase is open to avoid obstruction.

With a high-end fitout featuring local timbers, the tour will

further be enhanced by exquisite service and high-quality local cuisine. The galley and servery are linked by a dumb waiter, with the layout and function of the catering spaces attended to by a commercial food-and-beverage consultant. Interior features include the use of a stretched membrane ceiling in the upper deck, whilst the visibility is guarded by integrated demisting and exterior washing systems.

Principal particulars of *Spirit of the Wild* are

| | | |
|---|---|---|
| Length OA | | 33.3 m |
| Length WL | | 33.3 m |
| Beam OA | | 9.00 m |
| Depth | | 3.25 m |
| Draft | (hull) | 1.20 m |
| | (propellers) | 1.60 m |
| Passengers | | 192 |
| Crew | | 8 |
| Fuel oil | | 8000 L |
| Fresh water | | 3000 L |
| Sullage | | 2750 L |
| Main engines | | 2×MTU 10V2000M72 each 749 kW @ 2250 rpm |
| e-motors | | 2×ABB |
| Gearboxes | | 2×ZF3311 PTI |
| Propulsion | | 2×fixed-pitch propeller |
| Generators | | 2×Kohler 175EFOZDJ each 175 ekW |
| Speed | (service) | 25 kn |
| | (maximum) | 25 kn |
| | (Silent Drive) | 11 kn |
| Construction | | Marine-grade aluminium |
| Flag | | Australia |
| Class/Survey | | NSCV Class 1D |

## *Seastreak Commodore* from Incat Crowther

Incat Crowther is has announced the delivery of *Seastreak Commodore*. The vessel has been developed in response to significant growth in passenger volume at Seastreak, and brings the operator's fleet of Incat Crowther-designed vessels in New York to a total of eight.

At 45 m in length with a capacity for 600 passengers, *Seastreak Commondore* is the highest-capacity UCSG Subchapter K-classed fast ferry ever built. Incat Crowther worked closely with Seastreak to develop the unique layout and styling to allow 600 people to safely and comfortably undertake their daily commute. The vessel is also used on the weekend run to Martha's Vineyard and Nantucket. It is believed that this route constitutes the longest high-speed ferry run in the United States.

James Barker, President of Seastreak, commented "She was built both for New York commuter runs and for the open ocean, and performs exceptionally well in both applications. There are no other ferries in NYC which have the level of comfort, speed and size of *Seastreak Commodore*"

*Seastreak Commodore* continues Incat Crowther's approach of adding competitive advantage through technical capability. Whilst sharing similar overall dimensions, the vessel represents a step change from the fleet's previous large ferries, *Seastreak Wall Street*, *Seastreak New Jersey*, *Seastreak Highlands* and *Seastreak New York*. The boarding arrangement aligns with existing shore-based infrastructure


*Seastreak Commodore* on manoeuvring trials
(Photo courtesy Incat Crowther)

and includes large side gates forward and aft, as well as an adjustable bow ramp facilitating fast turnaround at many of the network's wharves.

The vessel was built at Gulf Craft in Franklin, Louisiana, and is powered by four MTU 12V4000 M64 EPA Tier III main engines, providing redundancy whilst operating efficiently at a modest rating. The vessel is propelled by KaMeWa 63S4 waterjets. During sea trials in the fully-loaded condition, the vessel achieved more than 38 knots at 100% MCR.

The interior features a high-end commercial finish with large, comfortable seats, faux-hardwood patterned carpet and LED lighting.

Seastreak and its fleet of Incat Crowther-designed vessels have been plying New York's waters for several decades, and the delivery of *Seastreak Commodore* comes at a time that New Yorkers rediscover modern ferries as a clean, efficient and comfortable mode of transport.

Principal particulars of *Seastreak Commodore* are

| | | |
|---|---|---|
| Length OA | | 45.0 m |
| Length WL | | 41.9 m |
| Beam OA | | 12.0 m |
| Depth | | 3.90 m |
| Draft | (hull) | 1.63 m |
| Passengers | | 600 |
| Crew | | 6 |
| Fuel oil | | 15 142 L |
| Fresh water | | 1893 L |
| Sullage | | 2650 L |
| Main engines | | 4×MTU 12V4000 M64 each 1398 kW @ 1800 rpm |
| Propulsion | | 4×KaMeWa 56S4 waterjets |
| Generators | | 2×John Deere 6068 SFM85 |
| Speed | (service) | 35 kn |
| | (maximum) | 38 kn |
| Construction | | Marine-grade aluminium |
| Flag | | USA |
| Class/Survey | | USCG Subchapter K |

## *Glory* from Incat Crowther

Incat Crowther has announced the delivery of *Glory*, the second 27 m catamaran ferry built by Gladding Hearn for MBTA of Boston, Massachusetts, following on from sister ship *Champion*.

When *Champion* was launched late last year, she was the 500th Incat Crowther-designed vessel to enter service.


*Seastreak Commodore* in service
(Photo courtesy Incat Crowther)

Following an enormously productive period for Incat Crowther, *Glory* takes that number to 529. At the heart of that growth is a range of multi-vessel mass-transit projects, such as four vessels for San Francisco's WETA and 18 vessels for NYC Ferry in New York. These projects demonstrate Incat Crowther's ability to work with public-sector operators to develop long-term solutions which balance a multitude of criteria.

The design is optimised for bow loading, with double-width gates and doors. The bow design integrates with existing shore-based infrastructure and the wheelhouse is designed to meet strict visibility requirements, allowing the captain to clearly see the foredeck.

Among the challenges of a modern commuter operation is the ever-increasing demand for passenger amenity. *Champion* and *Glory* deliver in this area with full disability regulation ADA compliance (including four wheelchair spaces and accessible bathroom), concession stand, luggage racks, bicycle storage for ten, a ticket counter, the requisite trash receptacles and, of course, wi-fi. This has been delivered in a compact package which achieves class-leading efficiency.

Just like *Champion*, *Glory*'s entire superstructure is isolated by resilient mounts, to reduce noise and vibration in the cabin, allowing the vessel to exceed the contractual requirements.

Starboard quarter of *Glory*
(Photo courtesy Incat Crowther)

*Glory* is powered by a pair of Caterpillar C32 ACERT engines, driving Hamilton HM571 waterjets, for a service speed of 26 kn and a top speed of 30 kn.

Principal particulars of Glory are

| | |
|---|---|
| Length OA | 27.15 m |
| Length WL | 24.6 m |
| Beam OA | 8.50 m |
| Draft (hull) | 1.30 m |
| Depth | 2.80 m |
| Passengers | 150 |
| Crew | 3 |
| Fuel oil | 6056 L |
| Fresh water | 757 L |
| Sullage | 757 L |
| Main engines | 2×Caterpillar C32 ACERT each 1081 kW @ 2100 rpm |
| Propulsion | 2×Hamilton HM571 waterjets |
| Generators | 2×John Deere/Marathon each 47 ekW |
| Speed (service) | 26 kn |
| (maximum) | 30 kn |
| Construction | Marine-grade aluminium |
| Flag | USA |
| Class/Survey | USCG Subchapter T |

## *Ocean Queen Rockstar* from Incat Crowther

Incat Crowther has announced the launch and delivery of *Ocean Queen Rockstar*, the first in a larger class of vessel for NYC Ferry operated by Hornblower. Built by Metal Shark Boats, Ocean Queen Rockstar is a 29 m, 350 passenger vessel which will be used for the operations' New York City–Rockaway run, which involves rougher water than the Hudson River and East River routes.

Ridership numbers for the service have been phenomenal. Having taken just 86 days to notch up their millionth passenger, NYC Ferry's figures have grown month-on-month, carrying nearly 4 million passengers in the first year of operation. This is not far off the projected annual ridership for a fully-operational network, despite starting with a reduced number of routes.

"We are excited at the arrival of the newest and largest NYC Ferry vessel", said Junior Volpe, Director of Special Projects. "The larger-capacity vessel will help cater for record-breaking ridership across the system, which has recently reached five million passengers since NYC Ferry's service launched in May 2017."

By any measure, this "zero-to-hero" trajectory is a success. The rapid rollout of vessels has been aided by Incat Crowther's close interaction with the shipyards involved. Incat Crowther's 3D production engineering allows for each vessel to be exactly duplicated with reduced production errors, and to be built efficiently and in record time.

With the increased ridership and increased demand, the larger-capacity vessel was developed. The development of this vessel followed a similar pattern to the earlier vessels, resulting in *Ocean Queen Rockstar*—the 18th vessel in the fleet—being in service just eight months after being ordered.

*Ocean Queen Rockstar* features increased length, beam and depth over the river vessels, seating 162 passengers in the main-deck cabin and 182 on the open upper deck. The vessel is fully disabled-access compliant and features a well-equipped concession stand, bicycle racks and bow loading, with direct stair access to the upper deck.

Powered by a pair of Baudouin 12M26.3 P2 main engines rated at 999 kW each, she is an efficient performer, operating at 24 kn at modest MCR, and is capable of a top speed in excess of 30 kn.

In addition to the design of the new Rockaway-class vessel, Incat Crowther has worked with NYC Ferry to increase the capacity of some of the first-generation boats. As the operation heads towards an annual ridership of nine million passengers, the value of this partnership will continue to be exhibited.

Principal particulars of *Ocean Queen Rockstar* are

| | | |
|---|---|---|
| Length OA | | 29.6 m |
| Length WL | | 28.1 m |
| Beam OA | | 8.50 m |
| Depth | | 3.50 m |
| Draft | (hull) | 1.00 m |
| | (propellers) | 1.60 m |
| Passengers | | 354 |
| Crew | | 8 |
| Fuel oil | | 7500 L |
| Fresh water | | 3974 L |
| Sullage | | 3974 L |
| Main engines | | 2×Baudouin 12M26.3 P2 each 999 kW @ 2100 rpm |
| Propulsion | | 2×propellers |
| Generators | | 2×RA Mitchell custom built |
| Speed | (service) | 24 kn |
| | (maximum) | 30 kn |
| Construction | | Marine-grade aluminium |
| Flag | | USA |
| Class/Survey | | USCG Subchapter K |

*Stewart Marler*

Port bow of *Ocean Queen Rockstar*
(Photo courtesy Incat Crowther)

## *Ultramar II* from Incat Crowther

Incat Crowther has announced the delivery of *Ultramar II*, the second in a series of high-capacity 48 m catamaran passenger ferries for Mexican operator Ultramar.

Built by Midship Marine in Harvey, Louisiana, *Ultramar II* has been designed specifically for the operator's busy Playa de Carmen–Cozumel run, offering high capacity, high durability and a world-class passenger experience.

The vessel's fitout is yacht-like, in keeping with Ultramar's 'Experience Innovation' motto and includes aquarium-themed feature walls and glass pieces, decorative ceilings, multi-colour underwater lighting, polished stainless-steel handrails, high-end entertainment system, and the list goes on.

The aft cabin on the main deck seats 214 passengers and includes a dedicated child-friendly area as well as a refreshment bar. The forward end of the vessel's main deck features a premium-class area with 64 seats. The foredeck seats a further 50 passengers. Behind the main passenger cabin, the vessel is fitted with a large enclosed cargo area with roller doors and spacious dedicated restrooms for male, female, and disabled patrons.

The mid-deck exterior has seating for 203 passengers plus a full-service bar and a sizeable stage for musicians to entertain passengers. A majority of the exterior area is enclosed on the sides and above and is air conditioned by the vessel's robust cooling system. An additional 52 premium-class seats are housed inside the mid-deck cabin.

Port bow of *Ultramar II*
(Photo courtesy Incat Crowther)


Starboard side of *Ultramar II*
(Photo courtesy Incat Crowther)

The roof deck includes seating for 264 passengers seeking to enjoy the Caribbean sunshine.

*Ultramar II* is fitted with a pair of MTU 16V4000 63L main engines, each producing 2240 kW at 1800 rpm, with the upgraded propulsion package offering additional speed and power over her sister, *Ultramar*.

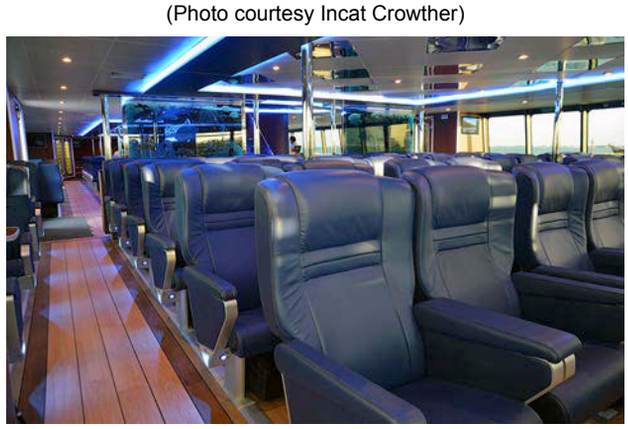
Incat Crowther will be sponsoring the 43rd Annual Interferry Conference in Cancun–Cozumel, Mexico, which is being hosted by Ultramar. This vessel and her sister-ships (including seven Incat Crowther-designed vessels and counting) will take centre stage. The close bond between operator and designer results in an optimal design focussed on servicing the client's and passengers' needs.

Principal particulars of *Ultramar II* are

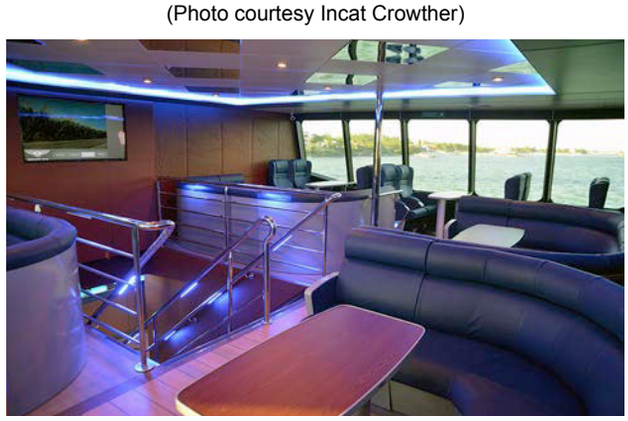
| | | |
|---|---|---|
| Length OA | | 48.8 m |
| Length WL | | 44.7 m |
| Beam OA | | 11.0 m |
| Depth | | 4.00 m |
| Draft | (hull) | 1.70 m |
| | (propellers) | 2.15 m |
| Passengers | | 844 |
| Crew | | 8 |
| Fuel oil | | 10 000 L day tanks |
| | | 10 000 L long-range tanks |
| Fresh water | | 1500 L |
| Sullage | | 1500 L |
| Main engines | | 2×MTU 16V4000 63L |
| | | each 2240 kW @ 1800 rpm |
| Propulsion | | 2×propellers |
| Generators | | 2×Cummins 6C-CP |
| Speed | (service) | 26 kn |
| | (maximim) | 30 kn |
| Construction | | Marine-grade aluminium |
| Flag | | Mexico |

*Ben Soileau*

View forward from aft main-deck cabin on *Ultramar II*
(Photo courtesy Incat Crowther)



Forward main-deck cabin on *Ultramar II*
(Photo courtesy Incat Crowther)



Mid-deck cabin on *Ultramar II*
(Photo courtesy Incat Crowther)

# The Acquisition of a Multi-role Aviation Training Vessel for the Royal Australian Navy

Alex Robbins
MATV Acquisition Engineering Manager

**Disclaimer**

The following presentation is wholly the opinion of the author, and is in no way representative of the official point of view of either the Commonwealth of Australia (CoA), the Royal Australian Navy (RAN), Damen Shipbuilders (DS), Lloyd's Register (LR), the Australian Maritime Safety Authority (AMSA), or Defence Maritime Services (DMS).

The author makes no claims pertaining to the success of the project, but does admit to being a noisy cog within the acquisition team. The author apologises in advance for any incidental over-use of TLAs and any "Jack Tar" jargon.

This presentation should be sub-titled "A lesson in project engineering".

**Introduction**

The acquisition of the Multi-role Aviation Training Vessel (MATV) is part of a much larger Australian Defence Force (ADF) project, being the upgraded Helicopter Aircrew Training System (HATS) project, which will train army and navy pilots to operate new-generation naval combat and battlefield helicopters. Known as Air 9000 Phase 7, the project will meet the future rotary-wing training needs of the Australian Defence Force. Additionally, the MATV enables other Secondary Training Services for the RAN.

The MATV acquisition route was not via the Capability Acquisition and Sustainment Group (CASG), but through the Fleet Marine Service Contract (FMSC) Contractor Asset Acquisition Programme (CAAP). The key MATV acquisition stakeholders were the RAN, the CoA FMSC CAAP Team, the DMS CAAP Team, Damen, and LR.

The MATV is a commercially designed, built, and operated steel vessel. The flag state is Australia with AMSA providing flag-state control, the classification society is Lloyd's Register, and the commercial vessel operator and maintainer is TeeKay (TK) Shipping.

The acquisition contract was signed by CoA and DMS in 2014, and the vessel was accepted in August 2017 — that's just over three years for a 94 m vessel. First-of-class flight trials for the EC135 helicopters occurred in September 2017, i.e. nine weeks after acceptance. The MATV's current Fleet Activity Schedule (FAS) Tasking is over 280 days per year, with that ramping up to over 320 days per year in 2019. Already the MATV is one of the busiest vessels in the RAN fleet.

The MATV was named MV *Sycamore* in tribute to the first type of helicopters obtained by the RAN, the British Bristol Type 171 Sycamore. The Fleet Air Arm's 723 Squadron in Nowra, NSW, operated these Sycamore airframes back in the 1950s.

The current squadron based in Nowra (427 Squadron) operates the helo airframes embarking onto the MATV, i.e. EC135s, MH60Rs, and NH90s.

**Vessel Specification**

The MATV is a 94 m SOLAS Special Purpose Ship (SPS) capable of round-the-world operations except for the artic poles. The vessel is unique in that, in addition to being a highly-capable SPS, it has multiple MIL-SPEC systems to enable ADF training operations.

Principal particulars of *Sycamore* are shown in Table 1.

**Key Project Features**

**Commercial Baseline**

Despite being a training vessel exclusively for the ADF, the MATV acquisition project was run exclusively along a commercial acquisition baseline. This extended to the contract, the designer, the builder, the safety strategy, the

Table 1 — Principal particulars of *Sycamore*

| Vessel Background | | Platform Particulars | |
|---|---|---|---|
| I. Acquired by DMS on behalf of CoA under the Fleet Marine Services Contract (CAAP).<br>II. Will deliver multiple aviation and FMSC training service.<br>III. Is a commercially designed and built (steel) vessel (by Damen)<br>IV. Is operated and maintained by a commercial (contract) crew.<br>V. Acquisition Contract Signed 2014, Vessel Accepted Q3 2017, (3 years)<br>VI. First of Class Flight Trials (EC135) – Sept 2017<br>VII. Helicopter Aircrew Training (HATS) Ops begin – Q1 2018<br>VIII. Tasked though Fleet Activity Schedule (FAS) – 280 days PA.<br>IX. Managed by CASG + CAAP + CVO | | Particulars | LoA = 93.96 m / Beam = 14.4 m / Draft = 3.6 m |
| | | Construction | Hull = Steel / Super = Steel |
| | | Speed | Max. = 17 kts @ 100% MCR / Econ. = 16.2 kts @ 85% MCR |
| | | Range / End. | 4,400 nm @ 85% MCR / 14 days for 113 embarked |
| | | Complement | Crew = 22 /ADF = 71 + 20 Day only |
| | | Propulsion | 2 x 3516 CAT Diesel / 2 x CPP w. loiter capability |
| | | Generators | 4 x w. Auto Sync. & paralleling + Emergency Generator |
| **Capabilities** | | Stabilisation | Quantum - Active Fin Stabilisers - 2 x 5,4m² |
| Primary | Aircrew Deck Landing Qualifications (with the Joint Helicopter School training as priority 1 – HATS) | Dyn. Pos | DP0 – 1 x 400kw Bow thruster + 2 x CPP +2 x Flap Rudder |
| | Flight Deck Op. Training (including HIFR and VERTREP) | Class | Lloyds Register of Shipping (LRS) |
| | Procedural Air Controller (PAC) / Helo Control Officer (HCO) | Flag | Australian Maritime Safety Authority (AMSA) |
| Secondary | Officer Sea Familiarisation Training | Homeport / Op Area | HMAS Waterhen / East Australian Exercise Area (EAXA) |
| | Operational Diving Support | **Aviation Particulars** | |
| | Practice Weapon Recovery | Helicopters | MRH-90 / MH-60R / EC-135 |
| | Consort Duties | Flight Deck | Modified FFH (HMAS Perth) w. ASIST |
| Latent | Unmanned Aerial Vehicles (UAV) | Air Radar | TERMA Scanter 6002 + Mode S / ADS-B |
| | Advanced SAR DF | FD Lights | AGI – NVG Compliant |
| | Humanitarian Aid Disaster Recovery (HADR) | Helo Bunker | 77 m³ of F44 Avcat (FP > 60°C) w. HIFR (pressure + gravity) |


MATV *Sycamore* on Sydney Harbour
(Photo John Jeremy)

regulator, the surveyors, the integrated logistic support strategy, and the in-service operations. The key was to embed all ADF requirements in to the specification *before* the commercial contract was signed. The outcome was successful, as is self-evident.

**Customer (Re)Focus**

The MATV designer and builder, Damen, considered the RAN to be a regular customer but with *very* specific requirements. This thinking flowed though the CoA and DMS acquisition teams.

**Clarity of Mission and Simplicity of Focus**

A long time ago, the author worked at Incat Designs in Sydney under the guidance of Phil Hercus AO. On each wall of the office, the words *Make it Simple* were written in letters 60 cm high. At the time, Incat was arguably the most successful and influential high-speed light-craft design office in the world.

This *Make it Simple* strategy was applied to the acquisition project.

**Simple Project Motto**

The project team had a simple motto and mission statement: *On Time, On Budget and On Specification*, and the vessel was. This motto was constantly repeated and, indeed, became prophetic.

*Sycamore* came into Sydney Harbour on time — in fact, a few days early — she came in on budget, and met her specification (and, in many key metrics, exceeded requirements).

**Simple Project Metrics**

As a sanity check on all decisions, the following metrics were utilised: *Operability, Safety, Maintainability, Regulatory*. How does this issue, this change, this decision, affect the vessel's operability, its safety, its maintainability, or its regulatory requirements at the component level, at the sub-system level, or at the system level?

Whilst not perfect, these metrics were very powerful in weeding out bad decisions, and empowering local decision makers.

**Simple Project Management Plan**

All large acquisition projects are significantly complex and generally have large impenetrable project plans. Such plans are usually read by only a few, and often they are just compliance documents. Frequently such plans become "shelfware"

However, describing the life cycle of the acquisition simply and graphically enabled the team to see the "big picture" and how their part inter-related to others. Each component of the life cycle and each activity can be broken down further to reach the required level of resolution and understanding.

**Concrete Requirements**

Changing requirements is the bugbear of many complex programmes, usually having massive effects on budget and schedule. As such, a significant amount of time and effort was spent determining the requirements *before* contract signing. The end goal here was "no changes — no surprises".

Importantly, the adherence to system engineering principles ensured that each requirement had an agreed method of qualification (MoQ) and associated objective quality evidence (OQE) to verify that each requirement had been met. In this way the atypical "shouting match" or "guess and giggle" was avoided during trials.

**Outcomes vs Regulation**

Regulation is the written method of achieving a required outcome. No regulation set perfectly fits any requirements set. A bureaucratic mindset, which treats regulation as dogma, often leads to sub-optimal outcomes.

The MATV project took a pragmatic view of regulation, using the alternate proposal strategy to deliver compliant outcomes. This was enabled by the flexible thinking of the regulators, AMSA and the Defence Aviation Safety Authority (DASA).

**Project Team Characteristics**

The CoA and DMS CAAP team can best be described as being a small, motivated, empowered team with clear goals. In turn, the team delivered asymmetric outcomes in a short timeframe. Its key characteristics were:

**Small**

The strategy was to keep the team size small. This meant that information could be disseminated quickly and decisions made and implemented in almost real time The team had about 20 key members in total, CoA/DMS/Damen/LR/AMSA), with the management circle being about five people.

The small team strategy is the very opposite of the committee/working-group strategy. A small team is in keeping with the "keep it simple" strategy, i.e. has fewer moving parts.

**SQEP**

It is fundamentally important to have the right people making decisions. A metric for determining who should make a decision was to ask; *Is the decision maker a Suitably Qualified Experienced Person (SQEP)*?.

Frequently the decision maker had experience or had qualifications but not both, so a SQEP was sought.

**"Functional Flatarchy"**

Hierarchical and convoluted management structures are not efficient decision-making machines. Successful projects require good decisions (by SQEPs) to be made quickly.

A benefit of the small CAAP team was that the structure was nearly flat. As a result, every voice had near-equal weight, which led to a true sense of inclusion and empowerment in the decision-making process.

**Passionate**

Another benefit of the small CAAP team was that there was a true sense of ownership and, as such, passion for the vessel. It is true to say that *mostly* the team thought of the ship first and their own ego last.

**Constant Crew**

All efforts were made to maintain the CAAP team together for the life of the project. In this way valuable project history was not lost and the ownership of decisions was complete.

CAAP was some times described as Hotel California, i.e. *You can check out any time — but never leave*".

**Local**

Often it is the "incidental little chats over coffee" which ensure complete understanding across the project. The project team (CoA/DMS/LR) were all based within walking distance of each other, which enabled 100+ "coffee chats" (with banana bread) during the project.

**Shhhhhhh!**

*"Nothing travels faster than the speed of light, with the possible exception of bad news, which obeys its own special laws"* — Douglas Adams.

All projects have "bad news", due to failures, cost over-runs, arguments, etc. The key lies in managing this news. Again, having a small project team made this easy to do. A general understanding was not to gossip, but to solve issues locally before they became a technical and public-relations disaster.

**Key Lessons**

The key lessons are not complicated, but they are hard to implement well.

- Keep it Simple.
- Keep it Small.
- Keep Talking.
- Keep Listening.

Keep ***Smiling!***

**Conclusion**

MATV *Sycamore* is a 94 m vessel built by Damen Shipyards in Haiphong, Vietnam, and is now part of the upgraded Helicopter Aircrew Training System project which will train army and navy pilots to operate new-generation naval combat and battlefield helicopters. She was built on time, on budget, and met all requirements. She arrived in Sydney Harbour, and was accepted by the RAN in August 2017.

**Acknowledgements**

The author would like to thank the following:

Captain Allen Whittaker AM CSC RANR, the MATV Project Director, for his vision and trust.

Damen Shipyards, for allowing the use of their video and photographs for the technical presentation to RINA and IMarEST.

RINA and Engineers Australia, for providing the venue for the technical presentation.

**Videos**

There are videos available on YouTube of the vessel as follows:

MATV *Sycamore* sea trials

https://www.youtube.com/watch?v=TGAAoRQ9Lpw&frags=pl%2Cwn

MATV *Sycamore* entering Sydney Harbour
https://youtu.be/CETbq-nAQ4k


HMAS *Success* sails across a benign Pacific Ocean en-route to Papua New Guinea during Indo-Pacific Endeavour 18 (RAN photograph)

# Upgrade or Replace: A Cost Comparison of Australian Warship Service Lives

Alastair Cooper and James Mugg

This analysis of warship service life options comes at a time when Australia is planning to embark upon a substantial naval shipbuilding venture. The Australian Government is first and foremost seeking a domestic build for the next generation of warships but, more broadly, intends to stand up an indefinitely sustainable domestic shipbuilding industry.

Australia has for several decades pursued a stop-start warship acquisition process, in which most vessels serve for about 30 years, generally including a major mid-life upgrade. The decision to pursue a continuous shipbuilding program now provides a chance to consider alternative models for the provision of warfighting capability. This *Strategic Insight* looks at the implications of warship service life for the overall cost-of-ownership and the operation of the RAN as an enterprise, and proposes options for consideration in the development of the future submarine and frigate programs.

The publicly-available costings suggest that there's little difference in the annual cost of ownership between a 30-year-plus-upgrade service life and a 20-year-without-upgrade service life. That creates the possibility that the future frigate and submarine programs can consider service life options that enable other parts of the Navy to be optimised.

Because ships are the lynchpins for the sophisticated networks making up the enterprise, decisions affecting ship service life have direct implications for the naval enterprise and reverberate through the rest of Defence. To simplify the analysis, this paper compares a nominal 20-year service life with no major mid-life upgrade to a nominal 30-year service life which includes a major mid-life upgrade.

**Whole-of-life Costs**

Acquisition and maintenance costs are significant factors to consider in assessing the relative merits of different service-life options. Because the acquisition cost is amortised over the vessel's lifetime, it is plausible that a shorter service life makes a warship more expensive in the whole-of-life sense. If that were the case, a 30-year service life would be better than a 20-year service life because of the longer amortisation period. But the initial purchase cost is only one part of the cost of a warship; crew costs, maintenance, refits and upgrades must also be included to understand the total cost of ownership over a ship's lifetime.

Figure 1 shows an indicative comparison of two hypothetical shipbuilding plans. The first is the model employed by Australia and many other modern navies, in which a vessel receives a significant upgrade roughly halfway through its 30-year service life. The second model shows an alternative shipbuilding program in which a vessel is retained for only 20 years before being replaced. In both models, each vessel iteration is more expensive than the last (the cost growth is matched to historical data). The model assumes that the operating costs increase in proportion to the acquisition cost, since the vessel's complexity drives both. This graph shows the cumulative cost over time for the two approaches.

At various times in the 80-year period shown, neither strategy is cumulatively more expensive, but the curves tend to 'leapfrog' when each successive class is built. The conclusion is that the biggest driver of the cost of maintaining a frontline navy is the steep increase in the cost of follow-on classes due to real cost increases for capability. Any savings that might accrue in the 30-year strategy from amortising the build cost over an additional 10 years is offset by the greater cost of the follow-on class. This is a simple model, and real-life data will be less regular, but the broad conclusion that replacement costs dominate the long-term cost of naval capability is entirely consistent with observed trends in naval force structure around the world.

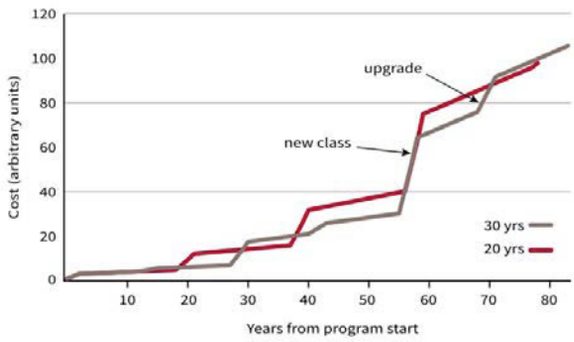



Figure 1: Cumulative costs of the two strategies (Graph courtesy ASPI)

Using the cost information in Department of Defence annual reports, it is possible to (roughly) assess the total cost of ownership for current Australian ship classes. Table 1 sets out the published build, upgrade and sustainment costs for the Adelaide-class guided-missile frigates, Collins-class submarines and Anzac-class frigates, and calculates the cost per vessel per year. The costs have been adjusted for inflation to use Australian dollars in 2016 as the base. The calculation also assumes that, after 20 years of service life, a vessel's operational value is effectively zero, and so it must either be replaced or refurbished and upgraded. The sustainment costs for all three classes are available as a consistent series only since the 2007–08 financial year, so there is insufficient coverage of the existing classes' service lives to clearly demonstrate any long-term trends (such as the bathtub curve that was anticipated by the 2011 Rizzo Report [1]). For the purposes of this analysis, consistent with the available data, we use a constant sustainment cost in the initial analysis and discuss the implications of cost increases later.

**Table 1: Amortised annual cost per vessel in service (A$ millions 2016)**

| | Adelaide FFG | Collins SSK | Anzac FFH |
|---|---|---|---|
| 20-year service model | 69.0 | 133.9 | 68.4 |
| 30-year service model | 72.3 | 125.6 | 62.1 |
| % difference | (+4.7%) | (–6.2%) | (–9.3%) |

Note: A full detailed table is shown in the Appendix.

Within the uncertainties of the available data, there's no clear difference in support costs between the 20-year and 30-year approaches. The published data suggests that the per-year, amortised cost of ownership for each of the Royal Australian Navy's three major combatant classes varies by less than 10% between the 20-year and 30-year service life options. The Adelaide case indicates that a 20-year service life as the

least-cost option, and the Collins and Anzac cases indicate a 30-year service life as the least-cost option.

While there's no basis in the Australian data for a bathtub effect, it makes little difference in practice. If we assume that there is a 10% premium for sustaining an ageing platform (service life 21–30 years), then the Collins model indicates that the 20- and 30-year options would be effectively equal cost, while the Anzac 30-year option remains the least cost. If there's no such premium on sustaining an ageing platform it may, in some cases, be worth the additional 10% of the expense for a new, distinct platform. And it may avoid some of the complications that come with adding new capabilities to older platforms—commonality is an often-undervalued efficiency.

The crew costs over a class's life must also be considered when assessing the overall cost of ownership. For example, the addition of new systems to an existing platform, whether part of a mid-life upgrade or not, will tend to increase the crew numbers simply because the new systems need operators and maintainers. Using the Adelaide-class FFGs (183 crew on commissioning, 199 in 2017) or Anzac-class FFHs (163 on commissioning, 177 in 2017) as examples, a ship in the last decade of its life could have a crewing requirement of around 5–10% greater than in its first decade, equating to 10–15 additional crew. If each crew member costs an average of $200 000/year, the extra crew cost for an ageing platform could be $2–3 million/year for a surface vessel — just a few percent of the overall sustainment cost in any case. The space and weight constraints of submarines might preclude such significant crew increases, but the boats could still be subject to calls for lesser additions. While a new design may or may not have a smaller crew, it's likely to be able to utilise the crew more efficiently.

The above data uses current classes as a template, which might not necessarily translate directly to Australia's future frigate and submarine programs. The current major combatants were acquired using a start-stop approach, each with a different design heritage and team which may not have been easily available to plan upgrades. So the design, planning and execution of mid-life upgrades were almost certainly more unpredictable, difficult and expensive than they would have been as part of a continuous design and construction program.

By way of comparison, the US Navy's Arleigh Burke-class program gives an indication of what's possible. The first Arleigh Burke cost US$1.1 billion to build (US$2 billion in 2015 dollars, adjusted for inflation [2]), while in 2015 the build cost of the most recent (and therefore most capable) Flight III Arleigh Burke has been estimated to be about US$1.7 billion [3]. The Flight III was conceptualised in response to the truncation of the expensive Zumwalt class and demonstrates how an entirely new baseline design may not be the only way to increased capability. By modifying an in-service design, the US Navy can reduce the technical risk of the program.

At the same time, several of the older Arleigh Burke-class ships are being upgraded and having their hulls revitalised, which will extend the service lives of some of the earliest vessels in the class to about 40 years. This approach allows the US Navy to keep a greater number of large combatants in service as the old Ticonderoga-class cruisers retire, while introducing new capabilities through both old and new-build vessels. If the Flight III ships are all built, the Arleigh Burke class could have a heritage of more than 60 years.

The conclusion that can be drawn is that a continuous design-and-construction approach enables flexible replacement and upgrade options which might otherwise be unavailable. Either an upgrade or a replacement approach — or both — can be chosen, depending on the considerations of the day, whether they be strategic, fiscal or otherwise.

**Organisational Impact**

The ability to conduct a mid-life upgrade must also be considered as part of the comparison between the 20-year and 30-year-plus-upgrade options. Although warships are almost continuously upgraded in different ways, by about the 20-year mark a major mid-life upgrade is required for two distinct but equally important reasons: first, to ensure that the structure and platform systems remain capable for combat conditions (not just for routine service) and are upgraded when necessary or desirable; and, second, to allow for the fitting of new weapons, combat and communication systems and their integration with legacy systems and the platform itself.

Just to carry out such an upgrade is a significant undertaking, often similar in complexity and scale to designing and building a new vessel. Both a new build and an upgrade have a big impact on the Navy enterprise; the provision of trained crews and logistic support arrangements are two major examples. New systems require personnel with new skills to operate and maintain them, so the Navy training pipeline must evolve to have a continuous supply ready for when the ship completes its upgrade. Similarly, the supply system must have appropriate parts and consumables for the new systems. Equivalent adjustment also occurs in the industry parts of the Navy enterprise, the importance of which shouldn't be underestimated: the ability for the Navy to be a reliable contracting partner has an impact on the overall value-for-money outcome.

If the delivery of any one element is delayed — the completion of the ship upgrade or build itself is the most obvious — then the cost to the Navy of the overall process increases. While the cost might not be seen in the project itself, the overall Navy enterprise will be forced to adapt to the delay, and the costs will accrue in disparate parts. The programs for other ships will need to be adjusted in large and small ways: dockings will need to be rescheduled and training and operational commitments deferred or met with different platforms.

In some cases, there will be alternatives or contingency in the system; in other cases, there will not. The delays in the completion of the Hobart-class DDGs give an indication of the impact. In that case, not only did the Navy enterprise need to continue to maintain and operate old vessels (the Adelaide-class FFGs) for longer than originally planned, but the number of rescheduling processes for the completion meant that the provision of a trained crew and supply arrangements had to be adjusted the same number of times. Given the fraught nature of warship building in Australia over the past decades, it wouldn't have been acceptable for there to be any suggestion that a ship's entry into service was

delayed due to a lack of crew. An important conclusion from this analysis is that schedule performance — predictability — has a broad impact on the whole Navy enterprise (not just the upgrade or build project) and should be valued accordingly.

**Technological Development and Lead Times**

While predictability is highly desirable for both new builds and mid-life upgrades, it's easier to plan to achieve it at the new-build stage. In a new build, the technology to be incorporated can be accounted for in the design process. For a mid-life upgrade 15 or 20 years hence, while the general outlines of technological developments can be described, much of the detail needed to plan an upgrade is simply unknown and, hence, unpredictable. Moreover, depending on the size of the development, there might be a lead time of 5–10 years to plan and implement it, particularly if it's part of a package of work in a mid-life upgrade. This brings cost and engineering problems that can't necessarily be accounted for in the design process, even when the vessel is given significant margins for space and weight growth. Nonetheless, growth margins at design are still important, as technological refreshes and the fielding of new systems throughout the vessel's lifetime are important to ensure that combat capability is retained throughout service life.

Some technological upgrades can be incorporated within existing physical structures. Standard/Tartar missiles were fired from Mk13 launchers designed to fit in the same space as a Mk54 5 inch (127 mm) gun mounting, and software upgrades or upgraded computer processors don't necessarily need significant physical changes. But some technological upgrades might require major changes to, or even the replacement of, the existing physical structure: the incorporation of new materials for aircraft is one example, but new uses of existing ones could lead to the same result. For example, new technologies for signature minimisation and the ability to withstand combat damage are usually most efficiently incorporated at the design stage. The attempts to retrofit radar-absorbent material to the Adelaide-class frigates didn't achieve the same level of signature reduction as might have been possible if it had been fitted as part of the design and construction; nor would it have resulted in the same cost to maintain the underlying vessel structure against corrosion. In some cases, new weapons systems require much greater outputs from platform systems; for example, the demand for greater electrical generation and cooling system capacities is unlikely to diminish, particularly if directed-energy weapons fulfil their current promise.

**Shipbuilding as Part of a Continuous Design-and-production Program**

One of the key advantages of the continuous design-and-production model to which Australia is transitioning is the ability to use national shipbuilding capability for strategic advantage, responding to strategic circumstances and technological opportunities. It provides current and future opportunities to choose to keep the current fleet size or to increase it by varying production tempo and warship service life. For example, a 20-year model produces a more rapid production tempo and hence the ability to respond more rapidly to strategic or technological change and to be a fast and agile follower. This would enable the future frigate to be built in flights, which balances the benefits of using a proven ship design with an evolutionary approach to capability; adding new systems to newer vessels and possibly retrofitting earlier models where possible.

This analysis hasn't considered the impact of the 20- or 30-year options on the design and construction process or on approaches to maintenance. It might be that one or the other leads to greater efficiencies. If the costs for the two options are roughly equal, then a difference in production or in-service maintenance efficiencies could be a significant determinant [4]. What is certain is that, when viewing the production of combat capability as a national enterprise, it is necessary to understand the impact on defence industry just as much as the impact on the Navy and Defence organisations. What's not immediately clear from the cost information on the current Australian warships is whether a 20-year or 30-year service life is better suited to different types of vessel. A general observation of international navies suggests that larger vessels, such as aircraft carriers and replenishment vessels, tend to have longer service lives (35–40 years and more, with at least one major upgrade), whereas smaller vessels, such as patrol boats, tend to have shorter service lives (15–20 years, mainly without major upgrades). For aircraft carriers, this is probably a reflection of the cost of the air group, with the platform cost representing a larger proportion of the remaining cost of the capability. For smaller vessels and submarines, the margins for adding or changing systems are smaller, so the upgrade cost is more likely to exceed the replacement cost. The maintenance and sustainment requirements for submarines add another layer to be considered. This analysis suggests that the question of service life must be determined for each different program.

**Conclusion**

The most important conclusion to be drawn from this analysis is that Australia has a choice about how it produces its future warships. In the long run, a 20-year service life model for warships has a similar cost to a 30-year-plus-midlife-upgrade model. Within the uncertainties of our limited data, neither option is intrinsically more expensive. The long-term cost is far more dependent on the capability that is being installed on a vessel than on whether it is delivered at build or following an upgrade.

Australia has typically carried out mid-life upgrades to extend the service life of warships, and the upgraded vessels have been operationally effective vessels.

The question to be answered in the Australian context is whether the mid-life upgrade is necessary or desirable for the future-frigate and submarine programs. A shipbuilding program which prioritises low costs would leave open the possibility for either option to be considered at the time that an upgrade is being considered. For example, if the plan to upgrade the Adelaide-class FFGs had included an option to replace them at an earlier date, that may have been a more cost-effective means of improving the RAN's capability. And even that would have been a significant change to standard practice in Australia.

However, the current political environment suggests that the Australian Government is planning to stand up a continuous shipbuilding enterprise. Reducing the planned service life of future warships to 20 years could help to improve the

sustainability of such an endeavour. For a fleet of 12 large surface combatants and 12 submarines, a 20-year service life would allow for a continuous build tempo of one surface ship and one submarine roughly every 18–20 months. That's quite slow, but faster — and so more sustainable — than the tempo required for a 30-year service life, unless the fleet size grows.

A national enterprise-wide view does not mean that Australia will be forced to commit to one option; rather, it means that decisions can be made to suit our capability and circumstances. The transition to a continuous build approach, at least across frigate and submarine construction, is a large and complex task; anything which simplifies the task will contribute to lower risk, lower cost and greater likelihood of success. So, there's merit in Australia choosing to plan for a 20-year service life for the first batches of new frigates and submarines, with a suitable growth margin to enable combat capabilities to be kept up-to-date through that service life. Once the cadence of design and construction is established, Australia can look again at its options for warship service life.

## Appendix: Build, upgrade and sustainment costs for RAN vessels

**Table A1: Build, Upgrade and Sustainment Costs for RAN Vessels ($A million 2016)**

| Total spend | Adelaide FFG | Collins SSK | Anzac FFH |
|---|---|---|---|
| Build total | 4412.6 | 6387.0 | 5456.6 |
| Build cost/20 | 220.6 | 319.4 | 272.8 |
| Build cost/20 per ship | 36.8 | 53.2 | 34.1 |
| Upgrade total | 1872.0 | 1692.5 | 1229.6 |
| Upgrade cost/10 | 187.2 | 169.3 | 123.0 |
| Upgrade/year/ship | 46.8 | 28.2 | 15.4 |
| Sustain total (30 year) | 5794.8 | 14 526.2 | 8221.7 |
| Average sustainment/year | 128.8 | 484.2 | 274.1 |
| Average sustain/year/ship | 32.2 | 80.7 | 34.3 |
| 30-year total per ship | 2169.2 | 3767.6 | 1863.5 |
| 20-year total per ship | 1379.3 | 2678.5 | 1367. 2 |
| Cost/ship/year (30 year) | 72.3 | 125.6 | 62.1 |
| Cost/ship/year (20 year) | 69.0 | 133.9 | 68.4 |
| Difference 30 year/20 year | (+4.7%) | (–6.2%) | (–9.3%) |

This table uses data from Defence annual reports for the build, upgrade and average sustainment costs of three RAN vessel classes: the Adelaide-class guided-missile frigate, the Collins-class attack submarine, and the Anzac-class frigate. The intended result is a cost comparison between a 30-year model which includes a mid-life service upgrade and a 20-year model which includes no upgrade.

The assumption is that the build would produce a vessel with 20 years of useful (in a capability sense) service life and that an upgrade would provide a further 10 years. (In practice, a vessel would be out of service for some time during the upgrade but, for our purposes, we assume a total of roughly 30 years in service.)

We decided that the annual cost per vessel for each model would be the best common level at which to compare the two different models. Each cost was therefore broken down to a cost per year, per vessel. The 30-year model represents the sum of build, upgrade and sustainment costs (per ship/per year). The 20-year model excludes the costs of upgrading the vessels.

## Notes

[1] *Plan to Reform Support Ship Repair and Management Practices* (the Rizzo Review), Department of Defence, Canberra, July 2011, p. 36.

[2] Wayne Biddle, 'Main shipbuilder gets Navy contract for a new destroyer', *New York Times*, 3 April 1985.

[3] Ronald O'Rourke, *Navy DDG-51 and DDG-1000 destroyer programs: background and issues for Congress*, Congressional Research Service, 20 May 2016, p. 5.

[4] This is consistent with previous, much longer studies. See the Australian Naval Shipbuilding and Repair Sector Strategic Plan, Department of Defence, Canberra, 2002, p. 173.



## About the Authors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## About *Strategic Insights*

*Strategic Insights* are shorter studies intended to provide expert perspectives on topical policy issues. They reflect the personal views of the author(s), and do not in any way express or reflect the views of the Australian Government or represent the formal position of the Australian Strategic Policy Institute (ASPI) on any particular issue.


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https://www.aspi.org.au/report/upgrade-or-replace-cost-comparison-australian-warship-service-lives


Two Australian-built frigates, HMAS *Melbourne* and HMNZS *Te Mana* on the way to Hawaii for RIMPAC 2018
(RAN photograph)

# EDUCATION NEWS

## Australian Maritime College

### AMC and TAFE SA Partner on Shipbuilding Skills

The Australian Maritime College and TAFE SA have strengthened their joint capability to supply skilled workers for Australian continuous naval shipbuilding program following an agreement to collaborate on education and skills development.

On 18 July AMC and TAFE SA signed a memorandum of understanding to work together long-term to build a pipeline of skilled workers for the major naval shipbuilding projects in Australia, particularly in the areas of maritime engineering, design, project management, logistics and supply-chain management.

The benefits from the partnership are set to include direct pathways from TAFE SA Diploma and Associate Degree programs into AMC's Bachelor of Engineering, Bachelor of Global Logistics and Maritime Management, and Bachelor of Applied Science (Marine Engineering). Other benefits will include the enrichment of existing programs and new joint programs in response to industry requirements.

The partnership will also strengthen both institutions' existing collaboration with the Naval Shipbuilding College (NSC) and participation on the NSC's Delivery Advisory Council.

University of Tasmania Vice-Chancellor, Prof. Rufus Black, said that the agreement was a prime example of educational institutions working together to meet the evolving needs of industry.

"As a national institute, AMC is very much looking forward to collaborating with TAFE SA to bring nation-leading maritime education to help create more opportunities for more South Australians to participate in the growth of the shipbuilding industry," he said.

"By working collaboratively with TAFE SA, we will be able to create the integrated educational offering to enable people to advance their careers as the industry grows."

TAFE SA Executive Director Education, Brian Rungie, said that the new partnership would provide a valuable opportunity for TAFE SA to bolster the education and training opportunities which South Australians have for lifelong careers in the naval shipbuilding industry.


TAFE SA Executive Director Education, Brian Rungie, (left) and University of Tasmania Vice-Chancellor, Prof. Rufus Black at the signing of the MoU
(Photo courtesy AMC)

"AMC is a world-leading maritime education provider and has significant specialist teaching, learning and research facilities which are vital for the maritime and defence industries," Mr Rungie said.

"We look forward to working alongside their very experienced teaching staff and subject matter experts, who also have strong industry links. This will ensure that the quality of course development and delivery is maximised.

"The collaboration and resource sharing between both parties will provide great benefit and there is already a variety of plans and initiatives in the pipeline that will benefit both training providers and our students.

"Working with another experienced education provider will ensure that our curriculum and skills development aligns with the needs of the defence and shipbuilding industry."

### AMC joins Thales in Sonar Test Facility Plan

The Australian Maritime College has partnered with international defence firm Thales to investigate establishing a trials and test facility for naval sonar systems in Tasmania.

On 17 July Thales Australia, AMC and AMOG Consulting signed an agreement to co-develop a facility which can utilise northern Tasmania's deep-water lakes to test the next generation of Australian submarine and surface ship sonar systems.

Thales Australia CEO, Chris Jenkins, said that the initiative was part of the organisation's commitment to work collaboratively with leading Australian SMEs and universities to deliver high-technology leading-edge solutions for Defence.

"Historically, Thales has worked with AMC and AMOG Consulting on a number of sonar trials activities, and with the Australian Government's historic recapitalisation of the Royal Australian Navy, now is the time to investigate establishing a permanent facility," he said.

"From 1990 to 2000 Thales and AMC tested and calibrated the in-service array for Australia's Collins-class submarines in Tasmania's deep mountain lakes as they provide an ideal environment for sonar systems."

The ARC Research Training Centre for Naval Design and Manufacturing Director, A/Prof. Jonathan Binns, welcomed the opportunity to further AMC and the University of Tasmania's strategic alliance with Thales Australia.

"Thales is a founding member of the research training centre and this new agreement will build upon our work in understanding the hydroacoustics and hydrodynamics of sonar systems — how noise travels through water and how water moves around an object such as a submarine hull or ship's propeller," A/ Prof. Binns said.

"This collaboration with Thales will allow us to undertake cutting-edge research which will ultimately feed into the design, manufacturing and sustainment of Australia's next generation of naval vessels. Co-investment in infrastructure such as this project connects to University plans to grow its contribution to defence through focused investment in capabilities and scale across its network with a Defence Innovation and Design Precinct as its cornerstone."

AMC's A/Prof. Michael Woodward said that the college had a strong reputation for partnering with industry to provide innovative research solutions in a maritime context.

"AMC has a critical mass of technical expertise and physical research facilities in hydrodynamic experimentation, while Tasmania is blessed with deep and isolated lakes which are ideally suited for a scale of testing that has yet to be explored globally," A/Prof. Woodward said.

"Bringing both of these together presents a unique opportunity to develop a new and novel experimental testing capability, with the potential to attract further investment and industry collaborations to build Australia's naval research and development capabilities."

University of Tasmania Deputy Vice Chancellor (Research), Prof. Brigid Heywood, commented on the significance of this development in expanding the strong relationships with Thales and AMOG which have contributed to a number of projects linked to the technical design of submarines and their development.

"This new investment is an exciting new chapter in the Tasmanian Defence story. The proposed new facilities will bring industry, government and universities together in a strong collaborative R & D relationship to advance Australia's unique hydrodynamic testing facilities and provide leadership in a global context," Prof. Heywood said.

"The University's Defence Network was designed to foster collaborative models of working which bring SMEs and major defence contractors together with government and the University's defence research capability to advance the $90 billion national shipbuilding program. This new initiative exemplifies the approach and strengthens key alliances, as well as showcasing the unique facilities of the Australian Maritime College."

## Smart Tech Research to Advance Ship Design

University of Tasmania School of Engineering researchers are helping to advance Australia's ship design capabilities, further bolstering the high-speed ferry industry's multi-million dollar export potential.

Dr Jason Lavroff and his research team were awarded $460 000 in the latest round of the Australian Research Council's (ARC) Linkage Project scheme. Dr Lavroff will work directly with industry to develop a "smart" semi-autonomous interface.

The technology, which includes a real-time on-board monitoring and feedback system, will lead the way for increasing ship safety, vessel longevity and improving passenger comfort for vessels worldwide, including high-speed catamarans. The work is significant as it will impact on design rules used worldwide, reducing weight and increasing payload and transport efficiency for this class of vessel.

"The high-speed ferry industry is a major export earner for Australia with annual revenue of $100 million," Dr Lavroff said.

"World-class, research-informed ship design is crucial for maintaining and maximising Australia's competitive advantage in this critical sector."

The University of Tasmania secured a number of grants, totaling more than $1.6 million, in the latest round of announcements for the ARC Linkage Project scheme.

University of Tasmania Deputy Vice-Chancellor (Research), Prof. Brigid Heywood, said that the success in funding further reflected the University's strength in working in partnership with industry and government to innovate and create next-generation technologies which advance Australia's competitiveness.

"Our cybermarine research has local and global impact, across a number of industry sectors, and our reputation to help drive innovation and economic impact is nationally and internationally renowned," she said.

## UNSW Sydney

## Undergraduate News

### Thesis Topics

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

*Finite Element Modelling and Direct Strength Analysis of Bulk Carriers*

Bulk carriers now play an important role in the international shipping sector, as more than 15% of the world's merchant fleet comprises bulk carriers. With increasing structural complexity, the ship's safety and reliability throughout its service life become the key concerns in the context of ship structural analysis and design. Unfortunately, the conventional ship structural analysis and design method can no longer provide reliable, accurate and economic solutions due to some inherent failings.

Jiong Wang studied the finite-element direct structural analysis prescribed by the International Association of Classification Societies (IACS) Common Structural Rules for Bulk Carriers (CSR-BC). In his project the direct structural analysis focussed on the direct-strength analysis. Specifically, the CSR-BC rule general principles were studied with an emphasis placed on the direct strength analysis of the hull girder. More importantly, the project practised this finite-element analysis technique on a 25 000 dwt bulk carrier in compliance with the CSR-BC prescriptive procedures for the direct strength analysis. The finite element modelling for three cargo holds was created first, and the finite-element direct-strength analysis was carried out for the CSR-BC designated load combination Cases 2 (seagoing condition) and 16 (harbour condition). Both structural modelling and analysis tasks were accomplished using the general-purpose finite-element analysis program ANSYS Workbench.

For both two-load combination cases, the finite-element simulated results showed some common regions of high stress, including deck plating, topside tank sloping plating, side frame, and the topside tank plating vertical strake. In addition, by comparison of the stress magnitudes of the structural members for both two-load combination cases, it was found that most structural members under load combination Case 2 were subjected to higher stresses. Nevertheless, in comparison to the CSR-BC strength-acceptance criteria, none of simulated maximum von Mises stresses of structural members was found to exceed their maximum permissible values and, hence, the overall hull-girder strength under both two-load combination cases can be concluded to be safe and satisfactory.

Furthermore, two verification approaches were conducted for load combination Case 16 (hogging) to verify the finite-element simulated results. The mesh convergence study indicated a clear convergence trend under mesh refinement for the scoped mid-hold deck plating, whereas the analytical solution of calculated bending stress at the middle point of the tank top also showed a reasonable discrepancy compared with the finite-element simulated stress result at the same point.

Further verification of these results in a future study would be beneficial. Nevertheless, rather than using costly specialised ship structural analysis and design software packages developed by classification societies, the use of a general-purpose finite-element analysis program (ANSYS Workbench) throughout this project presented an alternative feasible way to perform the ship structural analysis for compliance based on the CSR-BC for finite-element method calculations.

**Thesis A Conference**

The following Thesis A progress presentations on naval architecture student projects for Semester 1 were made on 30 May:

| | |
|---|---|
| Patrick Doherty | *Analysis of a Systematic Series of Icebreaker Bows* |
| Bona Enendu | *Innovation in Engineering Teaching and Learning* |
| Billy Gosper | *VPP Investigation of Sailing Yacht Bow Geometries* |
| Shashank Kalyanaraman | *Fusion Bonding of Thermoplastic Composites* |
| Patrick McManus | *Validation Study of the Blohm+Voss Type S Retractable Fin Stabiliser* |
| Seyit Sarioglu | *Prediction of Ship Squat in Shallow Water* |
| Jiabao Wang | *Plate-fin Heat Exchangers* |
| Yun Wang | *Analysis of the Naples Warped Hard Chine Hull Systematic Series Data* |

**Thesis B Conference**

The School's undergraduate Thesis B Conference for Semester 1 took place on 4 and 5 June. The following presentations on naval architecture student projects were made on 5 June:

| | |
|---|---|
| Mohammad Alimardani | *Numerical Prediction of the Wave Wake of a Foilborne Surface-piercing Hydrofoil* |
| Paul Darmanin | *Investigation of the Nacra 17 Olympic Class Catamaran* |

**Graduation Ceremony**

At the graduation ceremony on 19 June, the following graduated with degrees in naval architecture:

| | |
|---|---|
| Cameron Edwards | |
| Gian Maria Ferrighi | Honours Class 1 |
| Stefano Ferrighi | Honours Class 1 |
| Andy Green | |

At the graduation ceremony on 22 June, the following graduated with degrees in naval architecture:

| | |
|---|---|
| Brett Ryall | Honours Class 1 |
| Jiong Wang | Honours Class 1 |

Brett Ryall (R) with Phil Helmore at the UNSW Graduation Ceremony on 22 June
(Photo courtesy Shirley Ryall)

**Prize-giving Ceremony**

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

The Royal Institution of Naval Architects (New South Wales Section) Prize 2 for the best performance by a student in Year 2 of the naval architecture degree program to Isabella Yan.

The Royal Institution of Naval Architects (New South Wales Section) Prize 3 for the best performance by a student in Year 3 of the naval architecture degree program to Edward Hawkins.

These two prizes were presented by the Chair of the NSW Section of RINA, Valerio Corniani.

The Royal Institution of Naval Architects (Australian Division) Prize for the best ship design project by a student in the final year to brothers Gian Maria and Stefano Ferrighi for their separate designs of an 18 m composite cruising/racing yacht for a Geraldton owner.

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

Congratulations to all on their fine performances!

Valerio Corniani (R) presenting the Year 2 Naval Architecture Prize to Isabell Yan
(Photo courtesy Julisa Edwards)

Valerio Corniani (R) presenting the Year 3 Naval Architecture Prize to Edward Hawkins
(Photo courtesy Julisa Edwards)

**Graduates Employed**

Our graduates are now employed as follows:

| | |
|---|---|
| Cameron Edwards | Incat Crowther, Sydney |
| Gian Maria Ferrighi | Garda Carbon Lab, Riva del Garda, Italy |
| Stefano Ferrighi | Garda Carbon Lab, Riva del Garda, Italy |
| Andy Green | Professional navigator on yachts in Australia and Asia |
| Brett Ryall | Ocius Technology, Sydney |
| Jiong Wang | Evaluating opportunities |
| *Phil Helmore* | |

## Rolls-Royce Sells Commercial Marine Business

Rolls-Royce has announced that it has signed an agreement to sell its commercial marine business to Kongsberg Gruppen. Kongsberg, headquartered in Kongsberg, Norway, is an international knowledge-based group delivering high-technology systems and solutions to clients within the oil and gas industry, merchant marine, defence and aerospace sectors. Kongsberg is represented in more than 25 countries with approximately 7000 employees.

The move follows a strategic review by Rolls-Royce of its commercial marine operations announced in January 2018. The sale includes propulsion, deck machinery, automation and control, a service network spanning more than 30 countries and ship design capability, which to date has seen around 1000 ships of Rolls-Royce design delivered to offshore, cargo, passenger and fishing vessel customers worldwide. Rolls-Royce's ship intelligence activities, which have seen the rapid development of technologies to enable remote and autonomous operation of commercial vessels, are also included.

Kongsberg will, through a trading arrangement, continue to have access to products from Bergen Engines, which remains part of Rolls-Royce Power Systems. The Bergen engine range of both diesel and gas medium-speed engines is a key component which will enable Kongsberg to be a leader in the continued development of integrated ship systems. Kongsberg will also be an important partner and supplier to Rolls-Royce's Defence business for the supply of commercial marine products used on naval vessels.

Rolls-Royce Power Systems will continue to supply MTU engines to a range of customers in the marine market including operators of commercial vessels and yachts. The naval gas-turbine propulsion activities will continue to be a core part of Rolls-Royce Defence.

## Lürssen and Civmec form Joint Venture

The German shipbuilder Lürssen — the prime contractor in the SEA 1180 offshore patrol vessel program — has formed a joint venture with the engineering and defence contractor Civmec.

The joint venture will be called the Australian Maritime Shipbuilding and Export Group (AMSEG) and will play a major role in the construction of 10 of the 12 offshore patrol vessels for the Royal Australian Navy.

Additionally, the joint venture will explore possibilities of exporting its products in the region.

The announcement was welcomed by the Minister for Defence Industry, the Hon. Christopher Pyne MP, who said that the joint venture was another positive step forward.

"This is great news as the group will play a significant role in the Western Australian build of ten offshore patrol vessels using Lürssen's proven design," Minister Pyne said.

"The whole project is worth around $3.6 billion and construction of the first OPV will start in South Australia later this year using ASC."

"I commend AMSEG for their commitment to advancing Australia's sovereign shipbuilding capability," Minister Pyne said.

"By investing in Australian skills and infrastructure, and looking at opportunities to export to the global naval market, AMSEG is signalling its intent to be a key player in establishing Australia as a competitive shipbuilding nation."

## Local Companies show Interest in Submarine Program

Australian companies are showing a high level of enthusiasm to be part of the future submarine program.

The Minister for Defence Industry, the Hon. Christopher Pyne MP, said on 9 August thet more than one thousand local businesses have formally registered their interest.

Naval Group, as the Commonwealth's partner for the future submarines, and Lockheed Martin Australia as the combat system integrator, have held eight submarine industry days as part of ongoing engagement with local companies.

"As of 1 June 2018, 873 had registered interest with Naval Group, and 227 had registered interest with Lockheed Martin Australia," Minister Pyne said.

The list of what's needed is long and includes everything from air conditioning equipment to titanium products.

"Maximising Australian industry's involvement in the future submarine program is vitally important to the construction and sustainment of the submarine fleet into the future."

"This will create job opportunities across Australia and secure a long-term sovereign and sustainable local shipbuilding industry."

"It's critical that we establish the local capability to support the build, operation and sustainment of the future submarine fleet."

The $50 billion future submarine program is expected to generate an annual average of around 2800 Australian jobs, with 1100 direct and 1700 in the supply chain.

## BMT Acquires Effectiva

International engineering and technology consultancy, BMT, has announced the purchase of niche submarine design, engineering and assurance firm, Effectiva.

An employer of submarine specialists, Effectiva is based in Australia, South Africa and France. BMT said that the acquisition was part of the company's contribution to continued development of Australia's shipbuilding industry, adding that it would boost the company's local submarine expertise.

"BMT has a long-term commitment to Australia, one of the most exciting defence markets in the world, and this is an important strategic investment for the group. With this acquisition, we will now be even better placed to play an ever-more-predominant role in submarine design, engineering and assurance and meet the demands of a dynamic market," said Sarah Kenny, Chief Executive, BMT.

The purchase of Effectiva is the latest move in BMT's recent expansion of its Australia operations which now has a presence in most major Australian shipbuilding cities.

"The single greatest challenge in developing Australia's national shipbuilding industry ambition is having the right people with the right skills, and this is why we have brought Effectiva on board," Peter Behrendt, Managing Director, BMT Defence and Security – Australia, said.

## Austal USA opens San Diego office

On 17 July Austal USA opened a new San Diego operations office. The new facility will employ over 200 people, dedicated to service work for both the US Navy's Littoral Combat Ships (LCS) and Expeditionary Fast Transports (EPF). This location will serve as a base of operations on the West Coast for Austal USA.

## Taylor Bros Marine signs OPV Contract

On 18 July Taylor Bros Marine announced the signing of a major contract with Lürssen Australia.

Taylor Bros will be involved in the design, production and installation of the accommodation spaces on Australia's 12 Offshore Patrol Vessels.

"I'm pleased that Lürssen Australia has brought Taylor Bros Marine on board for the 12 vessels," the Minister for Defence Industry, the Hon. Christopher Pyne, said.

"This marks the ongoing involvement of Taylor Bros in Australia's continuous naval shipbuilding enterprise which has seen the company work on projects such as the LHD Amphibious Assault Ships and Air Warfare Destroyers."

"This latest announcement provides Taylor Bros employees with ongoing security and allows the company to retain its expertise in naval outfitting."

The company currently employs 90 personnel with around 60 per cent of its work being Defence related.

Lürssen Australia was selected in November 2017 to design and build the Navy's 12 OPVs.

## Terma Radars for OPVs

Saab Australia has awarded the Danish defence technology company, Terma, a contract for the delivery of its Scanter 6002 radars for the Royal Australian Navy's new offshore patrol vessels.

Terma Singapore is set to deliver air- and surface-surveillance radars for all 12 OPVs over a period of 10 years.

Terma's Scanter 6002 provides navigation, air and surface surveillance, and helicopter control. On the OPV, the Scanter 6002 radar is configured with its compact 3.6 m antenna and is integrated with the Saab Australia situational-awareness system. The radar enables the operator to detect surface and short-range air contacts and provides the capability to track and control air vehicles operating in proximity to the OPV.

## Wärtsilä's Divers provide Underwater Services

As the first global operator in the underwater services market, the technology group Wärtsilä now provides marine service and maintenance, regardless of the vessel's location. Maintenance and repair services performed by specialist divers add to Wärtsilä's comprehensive service offering and allow for operators to minimise or eliminate vessel downtime.

"Reduced fuel consumption, efficiency improvements, and higher utilisation rates are always on the top of operators' agenda. With our in-house specialist teams of certified diver technicians and propulsion experts, we are equipped to offer our customers underwater services on a truly global scale," said Tamara de Gruyter, Vice President, Area North Europe, Wärtsilä Services.

Late last year, Wärtsilä announced its acquisition of Trident BV, the leading worldwide provider of commercial diving services. With the acquisition, Wärtsilä became the first Original Equipment Manufacturer with a global underwater services footprint.

Wärtsilä's underwater service offering includes underwater repair, overhaul of propulsion systems, and regular maintenance such as hull cleaning and propeller polishing, as well as welding repairs and cofferdam repair. The retrofitting of some components of exhaust-gas cleaning systems, and even complex overhauls, can be carried out underwater, changing the nature of vessel repairs and maintenance.

"We have several research and development initiatives aiming at further expanding our underwater service offering. Currently, we are in the process of developing an environmentally-sound method for underwater hull cleaning. Unlike other available solutions, this unique hull cleaning service can cover close to 100% of the submerged hull," said de Gruyter. "Another one of our objectives is the integration of Trident's services with Eniram's analytics, aiming at achieving maximum fuel savings by optimising the hull cleaning cycle. In the future, Trident's underwater technicians will also work closely with their engineering colleagues at Wärtsilä to support them in product design which allows for easy underwater maintenance."

Wärtsilä's specialist underwater teams, based in the Netherlands, Italy, and Canary Islands can be dispatched in a matter of hours, thus enabling fast-response repairs as well as inspections, refurbishment, and equipment installation or replacement for vessels around the globe.

## US State Department Approves Aegis for Australian Frigates

The US State Department has approved the sale of Aegis combat system equipment for the Royal Australian Navy's new Hunter-class frigates.

The approved $185 million sale will include equipment associated with the integration of the Australian CEAFAR 2 phased array radar system with the Lockheed Martin-built Aegis combat system.

The items Australia requested to buy include long-lead items, engineering and development activities, establishment of engineering development sites, and commencement of development activities associated with the integration of the CEAFAR 2 phased-array radar system with the Aegis combat system.

Announcing its decision, the US Defense Security Cooperation Agency said that the sale would "support the foreign policy and national security of the United States by helping to improve the security of a major ally which is an important force for political stability and economic progress in the Western Pacific."

Once integrated with the CEAFAR, the Aegis systems will be fitted on the nine Hunter-class frigates to be built over the next 20 years.


The new Damen dredger featuring Wärtsilä propulsion equipment will be one of the most environmentally-sustainable vessels of its type (Image courtesy Wärtsilä)

## Wärtsilä Solutions for new Environmentally-friendly Dredger

Wärtsilä is to provide the engines, propellers, and control system for a new large-size hopper dredger being built by the Netherlands-based shipbuilding company, Damen Shipyards Group. The vessel has been ordered by Cemex UK, a leading supplier of building materials.

Wärtsilä will prepare the engines ready for use with selective catalytic reduction (SCR) technology to reduce emissions, making the vessel compliant with the International Maritime Organization's Tier III regulations. When delivered, the 103 m long, 4975 gross tons dredger will be one of the most environmentally sustainable ships of its type in operation.

Wärtsilä's full scope of supply includes two Wärtsilä 26 engines, two Wärtsilä 4D775 controllable-pitch propellers (CPP), and the Wärtsilä ProTouch control system. The Wärtsilä 26 engine is widely used in the dredger market, while the 4D775 CPP is a new and advanced offering. The Wärtsilä ProTouch system is a state-of-the-art response to market demands for a modern, compact control device. The equipment is scheduled to be delivered to the yard commencing at the end of 2018. The ship is expected to commence operations in the North Sea during the latter part of 2019.

## Ex-HMAS *Darwin* Destined for Tasmania

On 9 August the Minister for Defence, Senator the Hon. Marise Payne, announced that the recently-decommissioned guided missile frigate, *Darwin*, is to become a dive wreck in the waters off Tasmania.

*Darwin* sailed over 1 million n miles during her 33 years of service.

"The Government is pleased that ex-HMAS *Darwin* will be used in Tasmania as a dive wreck, particularly given the significant tourism and economic benefits which will flow from the decision," Minister Payne said.

Nationals Senator for Tasmania, Steve Martin, said that the decision to gift ex-HMAS *Darwin* to Tasmania would give a much welcome boost to the local tourism sector, creating new jobs and bringing more visitors to the east coast.

"The creation of a dive wreck offers small businesses in Tasmania the opportunity to capitalise on national and international interest to dive in the magnificent Tasmanian waters," Senator Martin said.

"This will bring additional tourists and spending to Tasmania, which will create and support local jobs, both directly and indirectly through the industries which support tourism in our state."

Liberal Senator for Tasmania, Jonathon Duniam, said that he had long championed a dive wreck on Tasmania's east coast.

"The addition of a dive wreck will super-charge our already booming tourism industry, attracting diving enthusiasts from all around the world, who will stay longer, and spend more in our local communities, particularly in the St Helens region," Senator Duniam said.

The Commonwealth and Tasmanian Governments will work together on funding arrangements for the vessel's scuttling.


HMAS *Darwin* sailing from Darwin for the last time in November 2017 (RAN photograph)

## AMSA Delivering Maritime Safety Services for Commercial Vessels

On 1 July 2018 the Australian Maritime Safety Authority (AMSA) started delivering domestic commercial vessel services, creating one national system to navigate.

For those who work in, or provide services to, the domestic commercial vessel sector, this means one set of rules to follow, one point of contact for services and one set of fees—no matter where you operate in Australia.

Going to the website, www.amsa.gov.au, is the quickest and easiest way to do business with AMSA. New online forms are available to guide you through the application and payment process, and you can do this at any time that suits you. There is also a range of self-service tools and resources to help you keep up-to-date with safety standards and requirements.

AMSA also has teams in 19 locations around Australia who are on hand to support you with new processes and systems, and give you technical advice about vessel and operations safety requirements.

If you need to talk to someone, the AMSA Connect contact centre is open from 8 am to 5 pm weekdays on 1800 627 484. Their highly-skilled customer-service team can answer most questions on the spot, or refer technical questions to our specialist team.

**What's New for Naval Architects and Accredited Surveyors**

With AMSA's new service options, there is greater flexibility to lodge applications and make payments online at any time.

Accredited surveyors can upload approved drawings, documents and survey reports directly to the online certification database, MARS. You can expect the processing time for certificates to be faster if you upload reports directly to MARS as the vessel construction proceeds, rather than making a single submission of all documentation at the end of commissioning.

The MARS system is your one-stop resource for generating lists of required surveys, depending on the vessel's particulars, and gives you access to all submitted survey reports when you need them. The online system also means that you no longer need to lodge paper drawings.

AMSA has also set up a dedicated page for surveyors of domestic vessels on their website. There you will find a variety of resources about the MARS system and guidance material which clearly sets out the approved national survey process and the documentation requirements that you need to follow so that there is consistency across all states and territories.

Introducing a single place to access national-system services means a new way of doing things for many of you—new systems and lodgement processes, updated forms and a new website to navigate. While you become familiar with how to do business with AMSA, they will continue to stay in regular contact to keep you updated and assist where needed.

*Kim Green*
Senior Advisor — National System Communications AMSA

## AMSA Updates

From 1 July 2018, the Australian Maritime Safety Authority (AMSA) has become the one point of contact for most services for domestic commercial vessels and crew.

If you are interested in keeping up to date with regulatory news and developments, you can sign up to receive *AMSA Updates,* a monthly e-newsletter, and *Working Boats*, a quarterly journal.

If you are an AMSA-accredited marine surveyor, then you will also receive the *Survey Matters* newsletter with the latest news specific for domestic commercial vessel surveyors.

For more information go to www.amsa.gov.au > news and community > newsletters > subscribe.

*Alicia Carter*
Senior Adviser — Stakeholder Relations, AMSA

## NSCV News and Updates

For news about the National Standard for Commercial Vessels and forthcoming updates, the regular NSCV update email from the Australian Maritime Safety Authority is best. Individuals can subscribe to receive it (and others) on the AMSA website at the following link:

https://www.amsa.gov.au/news-community/newsletters

*Dan Glover*
Media and Parliamentary, AMSA

## Marine Orders Updates

For news and information about Marine Orders and forthcoming updates, please send an email to consultation@amsa.gov.au, specifying which particular Marine Order you are interested in.

## IMO Document Updates

For news and information about forthcoming updates to IMO documents, please send an email to ir@amsa.gov.au, and you will be added to the circulation list for future correspondence to stakeholders for consultation or information by AMSA's Document Officer, International Engagement.

However, it is necessary for you to advise in which particular area(s) your interest lies, i.e. the name of the committee, sub-committee, or any particular correspondence group, so that you can be included in the correct group-email list.

The IMO website www.imo.org is the best place to get all IMO information, so this is a good place to start. On the IMO website there is a link to the "Knowledge Centre" which can take you to all IMO resolutions emanating from all Committees. To access IMO meeting documents and circulars you need to go through the IMODOCS link and register under Public Account. If you click the Register button it will take you through the registration process including setting up of a password.

Representing Australia at IMO, AMSA is currently engaged with the following Committees and attends their meetings:

- Maritime Safety Committee (MSC)
- Marine Environment Protection Committee (MEPC)
- Technical Cooperation Committee (TC)
- Legal Committee (LEG)

- Facilitation Committee (FAL) led by Department of Infrastructure and Regional Development and Cities (DIRDC)
- Sub-Committee on Carriage of Cargoes and Containers (CCC)
- Sub-Committee on Human Element, Training and Watchkeeping (HTW)
- Sub-Committee on Implementation of IMO Instruments (III)
- Sub-Committee on Navigation, Communications and Search and Rescue (NCSR)
- Sub-Committee on Ship Design and Construction (SDC)
- Sub-Committee on Ship Systems and Equipment (SSE)
- Sub-Committee on Pollution Prevention and Response (PPR)

Sub-committees SLF (Stability, Load Lines and Fishing Vessels), DE (Ship Design and Equipment), and FP (Fire Protection) were merged with SDC and SSE in 2014, and so these are all now covered by MSC.

All Sub-Committees except PPR come under MSC, while PPR comes under MEPC. You could therefore request just MSC and MEPC to be assured of receiving most of the updates.

As a Category B member of the IMO Council, Australia also attends Council (C) and Assembly (A) meetings.

Details of Committees including what they do are provided on IMO webpages which can be accessed through the links "About IMO" and "Our Work" from the homepage.

IMO adopts international shipping regulations but it is the responsibility of Governments to implement the regulations.

IMO's Technical Cooperation Committee (TC) is required to consider any matter within the scope of the Organisation concerned with the implementation of technical cooperation projects. TC is responsible for developing and administering the IMO's Technical Cooperation Programme (ITCP), which is designed to assist Governments which lack the technical knowledge and resources that are needed to operate a shipping industry safely and efficiently. TC also considers the IMO's management of the IMO Member State Audit Scheme (IMSAS), use of Country Maritime Profiles data, the use of global maritime training institutions in capacity building, strengthening the development of women in the maritime sector, and the IMO's implementation of the United Nations Sustainable Development Goals.

Committees and Sub-Committees establish correspondence groups from time to time as deemed necessary to progress any work inter-sessionally. Currently Australia (through AMSA) is participating in the following correspondence groups:

MEPC

1. Fuel Oil Quality.
2. Energy Efficiency Design Index (EEDI) review beyond Phase 2 — input to the correspondence group led by DIRDC.

PPR

1. Consideration of the Impact on the Arctic of Black Carbon.
2. Standards for shipboard gasification of waste systems and associated amendments to regulation 16 of MARPOL Annex VI.
3. Exhaust Gas Cleaning Systems.

NCSR

1. Standardised mode (S-Mode) of operation for navigation systems.

SDC

1. Safe mooring operations.
2. Carriage of more than12 industrial personnel on international voyages.

HTW

1. Comprehensive review of the 1995 STCW-F Convention.

CCC

1. Development of Technical Provisions for the Safety of Ships using Low-flashpoint Fuels.
2. Correspondence Group on the Suitability of High Manganese Austenitic Steel for Cryogenic Service.

*Zaman Qamruzzaman*
Principal Advisor Vessel Safety, AMSA

# THE INTERNET

## Victorian Section Webcasts

Following the purchase of recording equipment funded by the Australian Division, the Victorian Section has begun recording their technical presentations for subsequent webcasting.

Presentations recorded so far and the URLs of the webcasts are as follows:

- 14 March 2018 Robin Gehling, RINA, *Some Principles for Updating IMO's High Speed Craft Code,* available at https://youtu.be/6_aBHOiT1Yg
- 10 April 2018 Sean Langman and Belinda Tayler, Noakes Group, *A New Lease of Life for Sydney's Iconic Floating Dock,* available at https://youtu.be/0MMfMoDQBl0
- 21 June 2018 Warren Reid, Dynamic Military Loads Group, *Reducing the Vulnerability of Maritime Platforms to Underwater Weapon Attack,* webcast URL TBA.

*Jesse Millar*

# MEMBERSHIP

## Australian Division Council

The Council of the Australian Division of RINA met on the evening of Wednesday 13 June 2018 by teleconference under the chairmanship of the President, Prof. Martin Renilson in Launceston. As this was the first meeting of Council following the Division's Annual General Meeting, the President welcomed new Council members Adrian Broadbent (NSW Section), Ian Laverock (ACT Section) and Cameron Whitten (Queensland Section).

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

**Possible recognition of Navy training regimes**

Council tasked Mr Laverock with pursuing this matter in relation to CEng registration of civilian engineers.

**Not-for profit status of Division**

Following initial inquiries on the feasibility of obtaining this status, Council agreed to lodge an application with ACNC.

**Industry Mailing List**

Council is continuing to develop this list with emphasis on developing contacts at an executive level.

**Vice President**

Noting that this matter had been overlooked at its previous meeting, Council re-elected Jesse Millar to the position.

**Membership**

Council noted that new graduates may be attracted by other institutions and acknowledged the need to re-invigorate its activity in this area.

**Reports by Sections and Division Representatives**

To improve the exchange of information between Sections and Council, this regular item was expanded to include section reports, and Council noted the information provided by the ACT, Tasmanian and NSW Sections.

**Council Membership**

Noting that there was a vacancy as one Council member had resigned due to pressure of other commitments and another had indicated they may similarly need to resign, Council agreed to seek replacement member(s) inter-sessionally.

**Walter Atkinson Award 2018**

Council noted that nominations for the Award (see details at https://www.rina.org.uk/prizes_and_awards.html) would close in July and that the judging process was expected to be completed before next meeting.

**Next Meeting of Council**

Council tentatively agreed to its next meeting being held on the afternoon of Wednesday 12 September 2018.

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

*Rob Gehling*
Secretary

## 55-year Membership Certificate

Prior to the technical presentation to RINA (NSW Section) and IMarEST (Sydney Branch) on 1 August, the chair of the meeting, Phil Helmore, presented John Jeremy with a certificate for his fifty-five years of continuous membership of RINA. John worked at Cockatoo Dockyard and studied part-time at the University of New South Wales (now UNSW Sydney) and graduated with his BE degree with Honours Class 2 Division 1 in naval architecture (in the second cohort of naval architects with Conan Wu and David Hill, following UNSW's first graduate in naval architecture, Brian Robson). John then worked his way up through the ranks at Codock, ending up as Managing Director/Chief Executive and overseeing the eventual demise of the island as a shipbuilder and repairer. He is a former President of the Australian Division of RINA.

Membership certificates commence at 45 years, are given more rarely at 50, and even more rarely at 55 years! John is now a member of a select club.

Phil Helmore (L) and John Jeremy with his 55-year membership certificate
(Photo courtesy Martin Renilson)

## RINA Council and Committee Members

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

### Australian Division Council

| | |
|---|---|
| President | Martin Renilson |
| Vice-president | Jesse Millar |
| Secretary | Rob Gehling |
| Treasurer | Craig Boulton |
| Members nominated by Sections | |
| | Ian Laverock (ACT) |
| | Cameron Whitten (Qld) |
| | Adrian Broadbent (NSW) |
| | Kalevi Savolainen (WA) |
| | Karl Slater (Vic) |
| | Peter Dandy (SA&NT) |
| | Michael Woodward (Tas) |
| Members elected or appointed by Council | |
| | Walid Amin |
| | Jim Black |
| | David Gonzales Pastor |
| | Gordon MacDonald |

**ACT Section**

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

**NSW Section**

| | |
|---|---|
| Chair | Valerio Corniani |
| Deputy Chair | Phil Helmore |
| Secretary | Anne Simpson |
| Assistant Secretary | Jason Steward |
| Treasurer | Adrian Broadbent |
| Nominee to ADC | Adrian Broadbent |
| Auditor | David Wong |
| TM Coordinator | Phil Helmore |
| Members | Craig Boulton |
| | Noel Riley |
| | Alan Taylor |
| | Rob Tulk |

**Queensland Section**

| | |
|---|---|
| Chair | Tommy Ericson |
| Deputy Chair | Peter Holmes |
| Secretary | Hamish Lyons |
| Treasurer | James Stephen |
| Nominee to ADC | Cameron Whitten |
| Members | Mark Devereaux |
| | Steve Grogan |
| | Misha Merzliakov |
| | Mitchell Pearson |
| | Tom Pipon |
| | Adam Podlezanski |
| | Mitchell Todd |
| | Tim Vaughan |

**South Australia and Northern Territory Section**

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

**Tasmanian Section**

| | |
|---|---|
| Chair | Nick Johnson |
| Secretary | Brian Winship |
| Treasurer | Daniel Clayton |
| Nominee to ADC | Michael Woodward |
| TM Cooordinator | Jonathan Binns |
| Members | Jonathan Duffy |
| | Behrooz Enshai |
| | Henk Kortekaas |
| | Alan Muir |
| | Leong Zhi |

**Victorian Section**

| | |
|---|---|
| Chair | Siobhan Giles |
| Secretary | Owen Tregenza |
| Treasurer | TBA |
| Nominee to ADC | Karl Slater |
| Members | Riley Graham |
| | Sam Hunnibel |
| | James Nolan |

**Western Australian Section**

| | |
|---|---|
| Chair | Sammar Abbas |
| Deputy Chair | Alex Mosnier |
| Secretary | Matthew White |
| Treasurer | Andrew Phillips |
| Nominee to ADC | Kalevi Savolainen |
| Member | Cheslav Balash |
| | Nick Bentley |
| | Yuriy Drobyshevski |
| | Tim Gourlay |
| | Ian Milne |
| | Gino Parisella |
| | Mike Priestley |
| | Jinzhu Xia |

**RINA London**

| | |
|---|---|
| Council Members | Martin Renilson (*ex officio*) |
| Maritime Safety Committee | |
| | Rob Gehling |
| | Doug Matchett |

***International Journal of Small Craft Technology***

| | |
|---|---|
| Editor | Martin Renilson |
| Editorial Board Member | |
| | Phil Helmore |

***International Journal of Maritime Engineering***

| | |
|---|---|
| Editorial Board Member | |
| | Martin Renilson |

***The Australian Naval Architect***

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

**Walter Atkinson Award Committee**

| | |
|---|---|
| Chair | Karl Slater |
| Members | Alan Muir |
| | Michael Squires |

**AMSA Liaison Committee**

| | |
|---|---|
| Chair | Martin Renilson |
| Members | Walid Amin |
| | Craig Boulton |
| | Tom Dearling |
| | Mark Devereaux |
| | Gordon MacDonald |

**RINA/Engineers Australia Joint Board of Naval Architecture**

| | |
|---|---|
| Members | Rob Gehling |
| | Jesse Millar |

**Standards Australia Committee CS114 (Small Pleasure Boats)**

Mark Devereaux

**Standards Australia Committee ME059 (Shipbuilding)**

David Gonzalez Pastor

**Standards Australia Committee AS3962 (Guidelines for Design of Marinas)**

Mike Seward

**Pacific 2019 IMC Organising Committee**

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

**Pacific 2019 IMC Papers Committee**

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

## Continuing Professional Development

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

Continuing Professional Development will therefore enable the member to:

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

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

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

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

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

## Changed contact Details?

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

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

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

*Phil Helmore*

# VALE

## Don Dickson

It is with sadness that *The ANA* records the passing of Donald John Dickson on 2 June 2018, aged 92 years.

Don was born on 12 July 1925 in the front bedroom of the family home in Sydenham, Sydney, to parents William and Connie Dickson, the second of two sons.

He began designing boats at a very early age, with visits to his grandfather at Cronulla, where they would craft toy boats from wood and sail them on the fish pond. Don was educated at Tempe Public School and then, when the family moved to Rosebery, at Gardeners Road Technical School, where his school reports indicated his proficiency in Maths, Geometry, Science and Woodwork. From there he went to Sydney Central Technical School, where he obtained his Intermediate Certificate and gained a scholarship to further his education. He completed his Leaving Certificate at Sydney Technical High School to become a manual arts teacher. However, he decided to change paths, and joined Morts's Dock and Engineering Company in Balmain as a Cadet Ship's Draftsman from 1943 to 1945, working on drawings for frigates for the Royal Australian Navy, and taking an active part in sea trials and inclining experiments on both naval and merchant vessels. In 1943 he commenced diploma studies in naval architecture at Sydney Technical College. As reported by a colleague, Don was a master of calculus and assisted many times with mathematical problems and solutions.

In 1945 he moved to the Australian Shipbuilding Board, where he commenced as Ship's Draftsman on detailed

Don Dickson

drawings for merchant vessels for the Australian coastal trade. These include the 550 ton (559 t) "E" class, 2500 ton (2540 t) "D" class, 6000 ton (6096 t) "B" class, and 2000 t (2032 t) colliers. He continued attending night school at Sydney Technical College, graduating with honours in naval architecture in 1948. Thereafter he was mainly employed in general ship calculations and preliminary designs.

In 1951 Don moved on to take up the position of Mechanical Design Engineer with the Maritime Services Board of NSW, working on the design of dredges, hopper barges, floating cranes and slipways. One of his achievements there was the supervision of fitting out and the installation of the pontoon for the landing, from the royal yacht *Gothic,* of the Queen and Prince Phillip on their Royal Visit in 1954. In 1958 he was appointed naval architect in the Ship Survey Branch, working on the design of 66 ft (20.1 m) pilot vessels, 27 ft (8.23 m) crew boats, 21 ft (6.40 m) patrol boats, 16 ft (4.88 m) fast boats, and a 45 ft 13.7 m) tug, and stability checks and inclining experiments on numerous commercial vessels. In 1962 he transferred back to the Design Office as Naval Architect Section Leader, with staff to supervise the design of the MSB's 76 ft (23.2 m) VIP vessel *Captain Phillip* to replace *Lady Hopetoun* for sojourns on the harbour by dignitaries of the State and Federal Parliaments. Subsequent work included design of the 51 ft (15.5 m) pilot vessels, 27 ft (8.23 m) fast VIP boat and 27 ft (8.23 m) crew boat.

In 1967 he moved to Hawker de Havilland at Bankstown, taking up the position of Sales Manager of Military Craft. In 1968 he moved to take up the position of Naval Architect in the Ship Drawing Office with the Department of Navy at Garden Island in Sydney. His association with the Royal Australian Navy led him to the position of Sailing Master on the Navy's sail training yacht, *Franklin,* in conjunction with the New Zealand navy officer, Robert Hulford. Together they sailed with a crew of midshipmen in the Sydney–Hobart yacht races in 1967 and 1968.

Then, in 1970 he took up the position of Teacher-in-charge of the Naval Architecture Program at his *alma mater,* Sydney Technical College, giving his students their first inspiring taste of theoretical naval architecture. He was greatly admired by many students who passed through his program at STC, where he mentored and provided a bridge for students to careers in marine engineering and maritime navigation as well as naval architecture. His wide network within the workforce and advice in these fields led to many successful and accomplished professionals. He retired from there in 1985.

In his spare time, Don designed the 20 ft (6.10 m) Sea Scout Gig, *Anzac*, for the Port Macquarie Sea Scout Troop. He was also co-designer in 1956 of the well-known two-person 14 ft (4.27 m) Skate Sailing Dinghy for the Skate Sailing Association of Australia, with this becoming the original performance development class.

Don met Beth Cooper on a blind date, and they married on 4 February 1950 and lived in Cronulla. There they had three children, Susanne (Sue), William (Bill) and Bruce. Needing more space for the growing family, in 1962 they built a larger house in Oatley West. In their senior years, Don and Beth moved to a new, smaller house in Panania.

In his younger days, Don was a keen motorcyclist, touring NSW, Victoria and Tasmania. At his wedding, he met Beth's uncle, Jack Halliday, who was a classic blue-water yachtsman. Don offered to crew for him if he ever needed another deckhand and, within weeks, he was off in a 30 ft (9.14 m) yacht in the 1950 Sydney–Montague Island race. It was an initiating experience of foul weather, full-on gale, four of the crew of six were seasick, and for four days there were just Don and Jack working the yacht. He was *hooked!* From then on, sailing was in his blood, and he sailed three Sydney–Hobart yacht races on *White Cloud*, *Ellida* and *Corroboree*, and raced regularly on Sydney Harbour on *Salacia II*. He retired from rugged ocean racing in 1975, but still sailed regularly on Sydney Harbour until his skipper mate sold the boat in 2005. He has passed on his passion for and knowledge of sailing to his sons, his niece and his grandson.

In retirement, Don took up wood-turning, and enrolled in a three-year program at the Woodturning School at Sydney Technical College, from where he graduated as a qualified tradesman in that field. He installed a lathe in his workshop at home and enjoyed woodturning late into his retirement. With a shared love of travel, Don and Beth also spent a significant amount of retirement time adventuring in Australia and overseas.

A celebration of Don's life was held at the Reef Centre Chapel at Woolooware Shores Retirement Village, Taren Point, and was attended by a large number of family and friends and three naval architects.

Don is survived by his wife Beth, children Sue, Bill and Bruce, eight grand-children and five great-great-grandchildren.

*Sue Hennessy*
*Phil Helmore*

# NAVAL ARCHITECTS ON THE MOVE

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

Zia Ahmed, after a break following a long career with DNPS and DMO in Canberra, has taken up a position as a Senior Naval Architect with Thales Australia at Garden Island in Sydney.

Matthew Cleary has moved on within the University of Sydney, and has been promoted to the position of Associate Professor in the School of Aerospace, Mechanical and Mechatronic Engineering in Sydney.

Joe Cole has moved on within the Naval Technical Bureau and has taken up the position of Systems Engineering and Analysis (SEA) Domain Lead in Canberra.

Graeme Collins moved on from Fitzpatrick in London in 2008 and took up the position of Project Manager with Lend Lease in Sydney, where he has now taken up the position of Regional Development Manager.

Alexander Conway has submitted his doctoral thesis at the Australian Maritime College, and has moved on and taken up a position as a naval architect in the Hydrodynamics Section with the Defence Science and Technology Group in Melbourne, working on CFD.

Valerio Corniani has moved on from Composites Consulting Group and has taken up the position of Marine Manager with Diab Group in Sydney.

Pat Couser continues as Manager Software Development with Bentley Systems, telecommuting from Pau, at the foot of the Pyrenees, France.

Larissa Deck moved on from Delta Marine Industries in the USA in 2001 to concentrate on freelance writing, and now runs her own company, Ink Slinger Success, providing online writing courses from her base in Melbourne.

Jan de Kat continues as Director of Energy Efficiency with the American Bureau of Shipping in Copenhagen.

Shaun Denehy has moved on at the Australian Maritime College and has taken up the position of Research Engineer with AMC Search in Launceston.

Cameron Edwards, a recent graduate of UNSW Sydney, continues as a naval architect with Incat Crowther in Sydney.

Gian Maria Ferrighi, a recent graduate of UNSW Sydney, has set up a company, Garda Carbon Lab, in Riva del Garda, Italy, with his brother Stefano, and they are building foiling moths.

Stefano Ferrighi, a recent graduate of UNSW Sydney, has set up a company, Garda Carbon Lab, in Riva del Garda, Italy, with his brother Gian Maria, and they are building foiling moths.

Dane Fowler has moved on from the deceased Commercial Vessels Branch of Roads and Maritime Services and has taken up the position of Naval Architect in the new Domestic Commercial Vessel Safety Unit of the Australian Maritime Safety Authority in Sydney.

Nathan Gale has moved on from Rolls-Royce Australia and has taken up the position of Manager Management Consulting with KPMG Australia in Sydney.

Andy Green, a recent graduate of UNSW Sydney, has taken up a position as a professional navigator on yachts in Australia and Asia.

Fergus Hudson has moved on from Incat Crowther and has taken up a position as a naval architect with Austal Ships in Fremantle.

Nicholas Kyprianidis has moved on from the deceased Commercial Vessels Branch of Roads and Maritime Services and has returned to Greece.

Jesse Millar has moved on from Leidos Australia and has taken up the position of Naval Asset Consultant with Deloitte in Melbourne.

Graeme Mugavin has moved on from the deceased Commercial Vessels Branch of Roads and Maritime Services and is now an accredited AMSA marine surveyor and consulting as Marine Survey and Design in Sydney.

Tatiana Nasoufi has moved on from the deceased Commercial Vessels Branch of Roads and Maritime Services and has taken up the position of Team Leader of the Standards and Industry Unit in the new Domestic Commercial Vessel Safety Unit of the Australian Maritime Safety Authority in Sydney.

Steve Nichols has moved on from the deceased Commercial Vessels Branch of Roads and Maritime Services and has taken up the position of Manager of the new Domestic Commercial Vessel Safety Unit of the Australian Maritime Safety Authority in Sydney.

Paul O'Connor has moved on within Lloyd's Register and, in addition to his role as Surveyor in Charge South Asia Technical Support, has taken up the position of Lead Naval Surveyor in Sydney.

Brett Ryall, a recent graduate of UNSW Sydney, has taken up a position as a naval architect with Ocius Technology in Sydney.

Alex Walter has moved on within BMT Design & Technology and has taken up the position of Business Line Lead — Design and Engineering Services in Adelaide.

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

*Phil Helmore*

# FROM THE ARCHIVES

## HMAS *FLINDERS*

John Jeremy

One of the Royal Australian Navy's new Hunter-class frigates is to be named HMAS *Flinders*. She will be the second ship of that name in the RAN, the first being a survey ship commissioned into the RAN on 27 April 1973. She served for 25 years and was sold in 1998.

*Flinders* was designed by the Australian Shipbuilding Board for the RAN as a replacement for the coastal survey vessel HMAS *Paluma* (built in 1946) and was based on the design of a similar ship, *Atyimba*, which had been designed by the ASB for the Philippines. *Atyimba* was built by Walkers in Maryborough and was completed in 1969. *Flinders* was built by HMA Naval Dockyard Williamstown, Victoria. She was laid down in February 1971 and was launched on 29 July 1972.

*Flinders* displaced about 800 t and had an overall length of 49.07 m and a beam of 10.05 m. She was propelled by Paxman Ventura diesels driving two shafts for a cruising speed of 13 kn and a range of 5000 n miles. Her complement was 37, including four officers. For survey duties she could carry one 10.36 m survey motor boat and two 5.18 m aluminium runabouts.

HMAS *Flinders* (GS312) was based in Cairns and spent most of her working life in the RAN surveying waters around the Great Barrier Reef and northern Australia. After her sale in 1998 she was converted into the luxury motor yacht *Plan B*.

Now an expedition charter yacht based in Central America, *Plan B* has luxury accommodation for 12 guests in five staterooms. She can be chartered for about $US250 000 per week.

*Plan B* in the Caribbean
(Photo by Benoit Donne from www.superyachttimes.com)

HMAS *Flinders* in Sydney Harbour
(RAN Historical Collection)


Sydney's Cockle Bay was packed with boats for the annual Boat Show in early August
(Photo John Jeremy)