THE AUSTRALIAN NAVAL ARCHITECT

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November 2023

The US uncrewed surface vessel *Sea Hunter* passing under the Sydney Harbour Bridge on 24 October during a recent visit by the US Navy's Unmanned Surface Vessel Division One (USVDIV-1). Accompanied by USS *Oakland* (LCS24), the USVDIV-1 visitors comprised *Sea Hunter*, *Seahawk*, *Ranger* and *Mariner*
(US Navy photograph)

Seahawk alongside in Cockle Bay, Sydney, during Indo Pacific 2023. During their visit, USVDIV-1 exercised with the RAN testing the capabilities of these vessels and how they might integrate into maritime operations alongside crewed surface combatants
(Photo John Jeremy)

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Cover Photo:

Island Guardian, a new high-speed low-draft landing craft, for the Great Barrier Reef Joint Field Management Program, designed by Incat Crowther and built by Norman R. Wright & Sons
(Photo courtesy Incat Crowther)

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From the Division President

I have just arrived back home in Western Australia following my visit to this year's Indo Pacific Exhibition and International Maritime Conference in Sydney. The event has broken previous records for the number of exhibitors at the Exhibition—a testament to the hard work undertaken by all involved—well done! My experience of the IMC was of so many good papers, well presented and well attended, and both the IMC and the Exhibition provided us with probably the best networking opportunity for naval architects and maritime professionals in Australia—roll on Indo Pacific 2025!

Putting aside the on-going uncertainty about an outcome from the surface fleet review (the Minister for Defence advised at the opening breakfast that we would hear something from the Government "in the early part of next year"), one of the key themes which we heard across all sections of the defence maritime community was the critical need for a significantly-larger pipeline of professional engineers if we are to go anywhere close to meeting our expected commitments over the next decades. The need to effectively encourage and enthuse students and graduates at all levels into a maritime career was emphasised again and again.

To have a chance of making this happen, students (female and male) need to be targeted:

- At junior school to ensure that they want to take STEM subjects when entering senior school.
- At senior school to ensure that they want to continue with STEM subjects and, in our case, to consider taking on an engineering degree, diploma or trade apprenticeship on leaving school.
- At university, college or industrial apprenticeship to ensure that they want to continue with their studies and, in our case, to seriously consider naval architecture if they haven't done so already.
- And then, during their post-graduate career, to ensure their continued enthusiasm for the journey to full professionalism and the opportunities which this brings.

Given the need—right now—for naval architects and maritime engineers, and the very small numbers currently undertaking these programs, the third point above is likely to be a key pathway towards filling this urgent need. I am hearing that the two Australian institutions which offer naval architecture (AMC and UNSW Canberra) are both looking to expand their 2+2 offering around the country to encourage good undergraduates in related disciplines to take up naval architecture as a career. And why not? There are so many guaranteed opportunities right now for great careers in this the world's best, most varied and most interesting profession.

So, what part can RINA play in making this happen, individually or collectively? As many of you will be aware, there is quite a number of people and organisations already working in this space, e.g. REA's Subs in Schools (and some of our state sections are already involved), but so much more needs to be done, and I see the need for much greater coordination—for instance, in my home state of WA, I am aware of three great initiatives currently underway,

Jim Black

but apparently without knowledge of what each other is doing (I'm working on fixing that right now!) Here at the Australian Division, we have our Improvement Committee headed up by our Vice President, Jonathan Binns, and I think that is the right place for us to pool our knowledge of what initiatives are being undertaken nationally and in each state so the we can look to provide support (again individually or collectively) wherever we are able.

Please take every opportunity to assist in this critical endeavour: providing us with information, volunteering to talk in schools, universities and colleges, mentoring young professionals, and just taking any opportunity which you can to promote enthusiasm for naval architecture—it shouldn't be that hard—there is no better profession!

Jim Black
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Editorial

This edition of *The ANA* may be available just a little bit later than usual. The first week of November was occupied by a major event in the calendar of the Australian Division of the RINA—the International Maritime Conference (IMC 2023) which was held in conjunction with the Indo Pacific 2023 International Maritime Exposition at the International Convention Centre at Darling Harbour in Sydney.

The Exposition broke many records this year. Held over three days, the Exposition attracted 832 exhibitors occupying some 19 000 m^2 of exhibition space. Over 27 000 people attended the event—and over 13% of them were international visitors. 52 nations were represented as well as all eight Australian states and territories. There were 176 delegations from 46 nations and, noting the strong naval focus of the event, 48 Chiefs of Navy, counterparts of representatives attended over the three days of activity in Darling Harbour.

Our IMC 2023 conference, one of three major conferences conducted in conjunction with the Exposition, attracted 308 registrants and a wide range of topics were addressed. Building on past events, two of the popular panel sessions were included in this year's program. Our international maritime conferences have been part of the Pacific/Indo Pacific events for 23 years. Organised with our colleagues from the Institute of Marine Engineering, Science and Technology and Engineers Australia, the conferences would not be possible without the substantial support of AMDA Foundation, a not-for-profit corporation and the Exposition organisers.

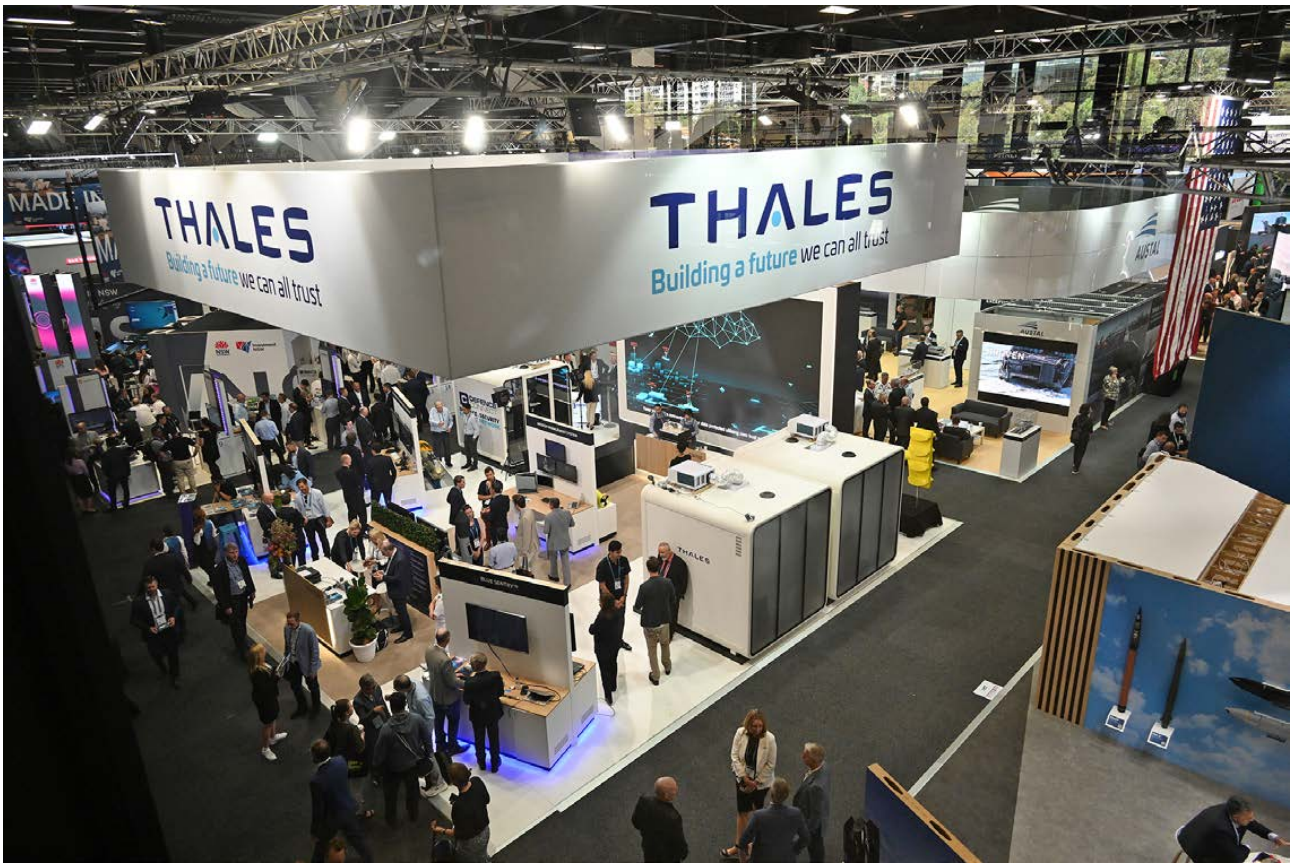
The IMC would also not be possible without the voluntary efforts of those who serve on the Organising and Program Committees, and referee panels for selected papers. Their work begins at least a year before each conference and the success of each event is considerable reward for them.

Planning for IMC 2025 will actually begin very soon, as we absorb the lessons learned this year before they fade into the past.

On a completely different subject, we report on Page 50 that, just before IMC 2023, the Commonwealth Government released the taskforce report on a Strategic Fleet for Australia and Government's response. The Australian merchant fleet has been in decline for decades. Now the Government has committed "to delivering a Strategic Fleet of up to 12 vessels which will help Australia build resilience to freight disruptions while supporting our maritime workforce and sovereign capability." Just how this will happen remains to be seen.

We are still awaiting the Government's response to the review of the structure of the RAN. Hopefully we are not going to suffer from that dreaded affliction—"paralysis by analysis".

John Jeremy



The crowded exhibition hall during Indo Pacific 2023 at the International Convention Centre in Sydney between 7 and 9 November (Photo John Jeremy)

COMING EVENTS

SMIX Bash 2023

The 23rd SMIX (Sydney Marine Industry Christmas) Bash will be held on Thursday 7 December aboard Sydney Heritage Fleet's beautifully-restored barque, *James Craig*, alongside Wharf 7, Darling Harbour, from 1730 to 2200. This party for the whole marine industry is organised jointly by RINA (NSW Section) and IMarEST (ACT & NSW Branch). Join your colleagues in the marine industry and their partners for drinks and a delicious buffet meal on board this unique vessel. Dress is smart casual, but no stiletto heels!

Bookings are now open for sponsors, members of RINA and IMarEST, and non-members on the Trybooking website https://www.trybooking.com/events/landing/1050495 at $60 per head for members and $75 for non-members. Payment may be made by Visa or Mastercard.

NSW Section Technical Presentations

Technical presentations are generally combined with the ACT & NSW Branch of the Institute of Marine Engineering, Science and Technology and held on the first Wednesday of the month (February through October) at the Sydney Mechanics School of Arts, 280 Pitt St, Sydney, or at a yacht club, and streamed live, starting at 18:00 for refreshments and 18:30 for the presentation, and finishing by 20:00. Guests are welcome.

The program of meetings for 2024 (with exceptions noted) is as follows:

7 Feb	IMarEST
6 Mar	Warren "Skip" Miller, Composites Consulting Group *From the Dream of a Naval Architect to a Composite Structure* Royal Sydney Yacht Squadron
6 Mar	RINA NSW Section Annual General Meeting
3 Apr	IMarEST
1 May	David Firth, Principal Engineer SEA1788, Naval Shipbuilding & Sustainment Group, Department of Defence *STS* Young Endeavour *Replacement*
5 Jun	IMarEST
3 Jul	Peter Thurling, AIMS Consultant, and Rob Tulk, Senior Naval Architect, One2three Naval Architects *The New AIMS Research Vessel*
7 Aug	IMarEST
4 Sep	Sean Lang*man,* Managing Director, Noakes Group, and John Butler, Principal, John Butler Design *Docking* James Craig *on the Floating Dock* Royal Prince Edward Yacht Club
2 Oct	RINA
5 Dec	SMIX Bash 2024

Warship 2024 Conference

Sponsored by BMT and supported by the RINA Australian Division, the Royal Institution of Naval Architects is once again hosting the highly popular Warship International Conference, with the 2024 instalment to be held on 18–19 June 2024 at the Adelaide Convention Centre, North Terrace, Adelaide.

The increasingly-complex warship design requires effective engineering assistance, design configuration control, supply chain and inventory management to meet operational requirements. With the introduction of autonomy and disruptive developments such as quantum technologies, could future operating concepts evolve leading to a step change in design requirements? With vessel design lives between 25 and 50 years, naval architects need to consider the effects of current and future technological and operational developments now.

Registration is subject to early-bird pricing:

	Before 1 Feb 2024	**From 1 Feb 2024**
RINA Member	£800	£900
RINA Non-Member	£900	£1000
Concession (retired/students etc.)	£400	£400
Authors	£200	£200
Additional authors	£800	£800

Registration is now available on the conference website (Click on Book Now):

https://rina.org.uk/events/events-programme/warship-2024-future-surface-combatants/

Cancellations received in writing up to two weeks before the event takes place will be subject to an administration charge of £200. Cancellations received after this time cannot be accepted and are subject to the full event fee. Delegates may be substituted; however, this must be sent in writing and confirmed with the RINA Events Team. It may be necessary for reasons beyond our control to alter the content and timing of the program. In the unlikely event that RINA cancels the event for any reason, our liability is limited to the return of the registration fee.

The conference will present technical developments in the design, construction and support of surface ships including, but not limited to, the following topics:

- Future navy surface fleet mix
- Design for constructability and supportability
- Facilities and shipbuilding
- Automation in ship design and construction
- Digital engineering
- Use of offboard autonomy—partially or fully autonomous ships
- Disruptive technologies

The call for papers was issued earlier, and abstract submission closed on 1 November.

For further information, contact the conference secretariat at <events@rina.org.uk>.

WARSHIP: FUTURE SURFACE COMBATANTS

18th - 19th June 2024
Adelaide, Australia

Explore the future of naval design, addressing engineering challenges and embracing technological advancements.
Dive into cutting-edge surface ship developments.

THE ROYAL INSTITUTION OF NAVAL ARCHITECTS

SPONSORED BY: BMT

NEWS FROM THE SECTIONS

Tasmania

Design and Construction of the new AIMS Research Vessel

Peter Thurling, Project Manager, Australian Institute of Marine Science, gave a presentation on *The New AIMS Research Vessel* from AIMS in Townsville via Zoom to the Royal Yacht Club of Tasmania in Hobart, to the Australian Maritime College in Launceston, and streamed live via to the wider fraternity) on 10 August. This presentation attracted 6 attendees in Hobart, 12 in Launceston, and 19 participating online.

The presentation, which was not recorded, is written up elsewhere in this issue of *The ANA.*

Greenwashing in the Big Blue Sea

Michael Woodward, Associate Professor Marine Engineering, Australian Maritime College, gave a presentation on *Greenwashing in the Big Blue Sea* at a room-and-zoom meeting (in person at the Australian Maritime College in Launceston, Zoomed to the Royal Yacht Club of Tasmania in Hobart, and streamed live to the wider fraternity) on 14 September. This presentation attracted 16 attendees in Launceston, 9 in Hobart, and 5 participating online.

Michael highlighted the true "cost", in terms of carbon emissions, of ship construction, operation and maintenance.

The presentation was not recorded.

Richard Boult

ACT

AUKUS—The Way Ahead for Australia

Martin Renilson, Adjunct Professor at AMC/UTas, led an in-person technical discussion on *AUKUS—The Way Ahead for Australia* at a meeting at UNSW Canberra at ADFA, with the Chair of the ACT Section, Warren Smith, as MC on 3 October. The presentation was attended by 29.

Martin provided a good overview of the various challenges which could be expected in pursuing this program. These include planned timelines for the leasing and acquisition of the submarine classes; consideration of Australian industry capability for submarine construction; the minimal current local nuclear industry base; timeframes needed to train the crews and supporting workforce; political hurdles to overcome—including technology transfer agreements and numerous political cycles from now until acquisition; cost estimates for acquisition and sustainment relative to the Defence budget and GDP. Martin also briefly touched on the need to extend the lifespan of the Collins-class submarines and the challenges which this in itself would present.

Following the overview, the floor was opened up for comments and questions, and this prompted a lively discussion for the remainder of the evening before the Chair drew the meeting to a close.

Due to the sensitivity of the topic, and so as to allow frank (but unclassified) discussion, the presentation was not streamed or recorded, and specific details of the discussion were not shared outside of the meeting.

The Presenter

Martin Renilson moved to Tasmania in 1983 to work at the Australian Maritime College, where he established the Ship Hydrodynamics Centre in 1985, and the Department of Naval Architecture and Ocean Engineering in 1996, with the first naval architecture and then ocean engineering degrees at AMC. In 2001 he moved to the UK to work at QinetiQ as Technical Manager, Maritime Platforms and Equipment. In this role he was responsible for all hydrodynamic research for the UK MoD, including all its submarine hydrodynamics. In 2007 he returned to Australia and has remained interested in submarine hydrodynamics. The second edition of his book on submarine hydrodynamics was published by Springer in 2018.

Martin Grimm
Warren Smith
Jordan Rayson

Martin Renilson presenting on AUKUS at the ACT Section
(Photo courtesy Warren Smith)

Keep your Keel On!

David Lyons, Senior Lecturer with UNSW Canberra at ADFA, gave a presentation on *Keep your Keel On!* at a meeting at UNSW Canberra at ADFA, with the Chair of the ACT Section, Warren Smith, as MC on 14 November, and streamed live. The presentation was attended by 8 with a further 23 participating online.

This presentation gave an insight into the systematic review process behind International Standard ISO12215 *Small Craft — Hull Construction and Scantlings* — Part 9: *Sailing Craft Appendages*. Just over ten years old, the standard needs updating, particularly given a spate of catastrophic incidents during the same period which have led to extensive loss of life. Focus areas of the review include the assessment of fatigue, inspection, structural plan review and survey. David discussed these areas and illuminated an area of

naval architecture which has proven to be both innovative and risky.

The presentation was recorded and is expected to be available soon on the RINA YouTube channel.

The Presenter

David is a Fellow of RINA and engaged in the naval architecture program at UNSW Canberra at ADFA. He has a background in practical design and naval architecture, with a career-long involvement in yacht design. Past credits include designing an overall winner of the Rolex Sydney–Hobart Yacht Race (*Micropay Cuckoo's Nest* in 1993), as well as several divisional winners. He chairs Working Group 35 reviewing ISO12215 *Small Craft — Hull Construction and Scantlings*, and is the Project Leader reviewing ISO12215 *Part 9 Sailing Craft Appendages*. In addition to his ISO role, he is a member of the Offshore Racing Congress's International Technical Committee. A practical sailor who has competed in Sydney–Hobart Yacht Races and internationally at the Admiral's Cup, David believes it is very important to contribute to the standards and rule-development process, in the interests of safety of life at sea.

Jordan Rayson

New South Wales

Committee Meetings

The NSW Section Committee met on 29 August and, other than routine matters, discussed:

- SMIX Bash 2023: Arrangements are progressing; sponsors have been contacted and sponsorships are arriving.
- TM Program 2023: Presentation for October has been postponed and a replacement is being sought.
- TM Program 2024: Five presentations already pencilled in and a further four being sought.
- Correspondence: Australian content now being gradually added to RINA's new website; feedback given to HQ re NSW Section content and HQ survey completed.
- Studying Naval Architecture: Web search for "study naval architecture" does not give a hit on RINA website; HQ advised.

The NSW Section Committee also met on 3 October and, other than routine matters, discussed:

- SMIX Bash 2023: Sponsorship pledges have continued to arrive and the budget is expected to be met; bookings have opened on the Trybooking website.
- TM Program 2023: Presentation for October has been secured.
- TM Program 2024: RINA now has four presentations for next year, and IMarEST is actively canvassing.
- Liaison with Nautical Institute (SE Australia Branch): A request has been received from the NI SEA for close liaison for technical presentations; they have previously liaised with the Company of Master Mariners of Australia, but CMMA have recently switched to lunch-time presentations which does not suit NI SEA members. Much discussion of pros and cons, and consultation with IMarEST and NI SEA ongoing.

The next meeting of the NSW Section Committee is scheduled for 11 November.

Australian Naval Classification

Mr Colin Dagg CSC, Assistant Secretary, Australian Naval Classification Authority, gave a presentation on *Australian Naval Classification* to a joint meeting of the NSW Section and IMarEST ACT & NSW Branch in the Henry Carmichael Theatre, Sydney Mechanics School of Arts in the Sydney CBD, with the Secretary of the IMarEST, Geoffrey Fawcett, as MC and streamed live on 6 September. The presentation was attended by 23 with an additional 31 online.

Introduction

Mr Dagg began his presentation by saying that Defence has three strategic priorities: to shape Australia's strategic environment, to deter action against Australia's interests, and to respond with credible military force when required. Australia's maritime capability is critical to the nation's future and, realising this, the Australian Government has laid the foundation for one of the largest recapitalisations of the Australian maritime domain in modern history, which is underpinned by a continuous naval shipbuilding enterprise. This has been reinforced through the release of the Defence Strategic Review (DSR), which reiterates the Government's commitment to optimising our vessels, and their ability to respond to operational tasking.

Australian Naval Classification

Australian Naval Classification supports sovereign shipbuilding. Government has established an enduring sovereign shipbuilding program, and Defence has a significant role to play within this new ecosystem. One important role is the specification of materiel seaworthiness requirements against which naval vessels are designed, constructed, certified and maintained. Implementation of an Australian Naval Classification (ANC) Framework delivers against this important role, which also aligns with the Government's priorities reiterated in the DSR.

One of the core components of the ANC Framework is flexibility, which allows it to adapt in line with evolving Defence strategy for maritime capabilities, enabling it to be applied to capabilities bought off-the-shelf and those designed and built in Australia.

Naval Design Rules

Defence needs contemporary and outcome-based naval design rules and standards which are:

- Aligned with Australian WHS and environmental legislation, and the Defence Seaworthiness Outcome (i.e. balancing safety, environmental protection, and the operational effect).
- Founded on international conventions—specifically, the NATO Naval Ship Code and Naval Boat Code—adopted and adapted for Australian requirements.
- Empowered through a robust framework, which is applied throughout the life of the vessel, including the design, construction, maintenance, and disposal phases.

Driving Principles

The ANC Framework embodies two driving principles, which enhance the technical interoperability with coalition and partner forces while optimising industry support for Australia's sovereign shipbuilding capability., These are:

- As international as possible and as Australian as necessary—leveraging best practice in terms of design standards and capability worldwide, whilst ensuring compliance with Australian requirements and legislation.
- As civilian as possible and as military as necessary—combining civilian classification models with Defence-specific requirements to ensure that operational outcomes can be met.

Development of the ANC Rules for Ships

The ANC Rules are founded on defensible and credible international convention for naval classification.

The Allied Naval Engineering Publication 77 (ANEP-77) is the NATO standard Naval Ship Code, which was developed by international navies and commercial classification societies as a benchmark for the design, construction and maintenance of naval vessels. ANEP-77 does not cover requirements for combat operations or extreme-threat conditions; however, these are included in the ANC Rules to address the full set of requirements against which an Australian naval vessel can be classified.

ANC Framework Benefits

Implementation of the ANC Framework will deliver a number of benefits:

- flexibility of outcome-based rules and standards, which allow pragmatic solutions for materiel seaworthiness compliance;
- simplified seaworthiness assurance outcomes using common and internationally-accepted maritime practices of classification;
- strengthened alignment and cooperation between departments across Government, coalition and partner forces, and industry;
- clarity and consistency of reporting to operational commanders on the materiel seaworthiness of vessels, to enable well-informed decisions when using naval vessels; and
- reduction of costs related to materiel assurance through greater certainty and clarity for industry, and reduced administration overhead.

ANCF Operating Model

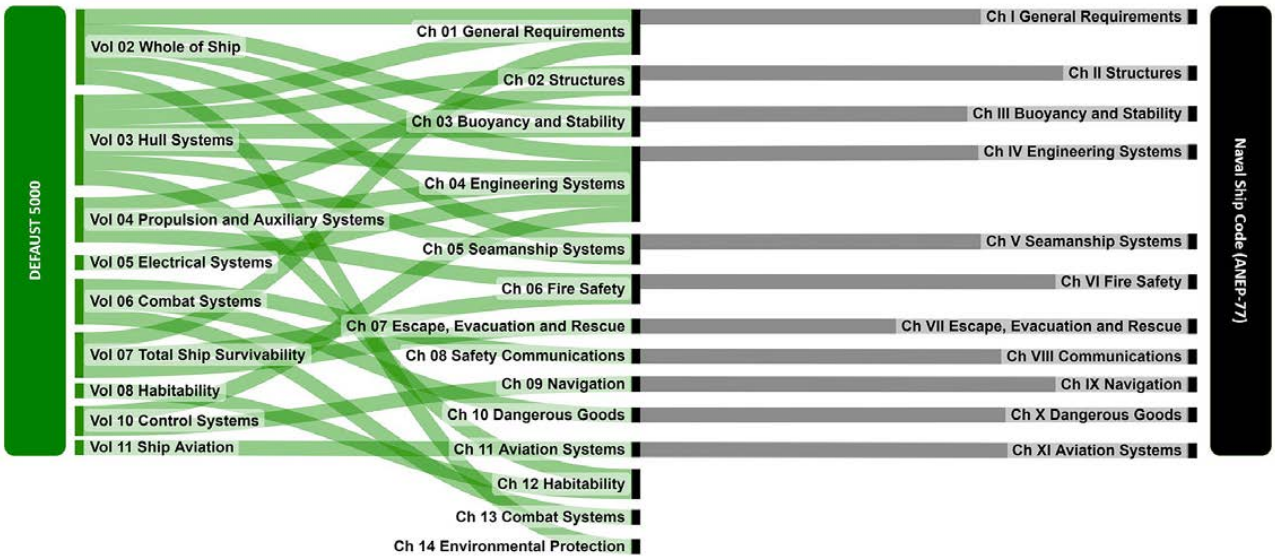
The ANC Framework is applied through an operating model which has two distinct phases: attaining and maintaining naval classification.

Attaining Naval Classification

- The ANC Rules are applied in the context of an Operating and Support Intent to develop the Australian Naval Classification (ANC) Basis for each vessel.
- The ANC Basis details the rules applicable to the vessel, the solutions to these applicable rules, and any justification for alternate solutions.
- Evidence of compliance against the ANC Basis is captured in an ANC Record.
- Evidence is gathered by competent organisations.
- Evidence is submitted to the ANC Authority for review and acceptance; the ANC Authority then issues the ANC Certificate.
- The vessel then enters the 'Maintaining Naval Classification' phase.

Maintaining Naval Classification

- Throughout the lifespan of a vessel, the ANC Authority will conduct oversight of continuous improvement and compliance with the ANC Basis.
- The Naval Vessel Operator (NVO) is responsible for maintaining the vessel in accordance with its ANC Basis. Non-compliances are reported to the ANC Authority and Conditions, Memorandums or Notes are issued.
- Changes to the vessel are managed by the NVO, and reported to the ANC Authority. All changes to the ANC Basis are to be approved by the ANC Authority.



Mapping of DEFAUST 5000 onto ANEP-77
(Diagram courtesy ANCA)

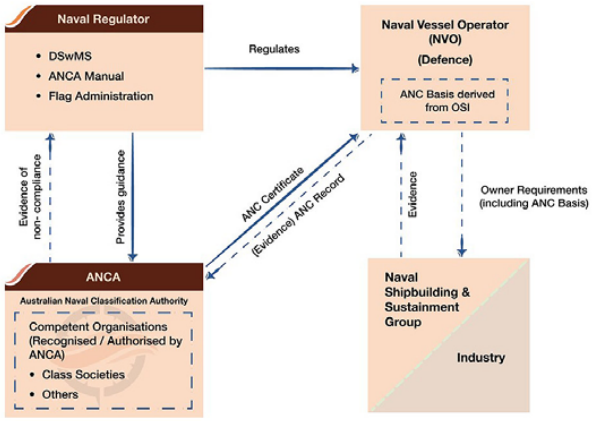
- The NVO is responsible for maintaining the ANC Record (for example through continuous surveys), which will be audited by the ANC Authority and other surveillance activities.

Australian Naval Classification Authority

The ANC Authority has been established by the Defence Seaworthiness Authority (DSwA) to administer the ANC Framework, prescribe Australian Naval Classification Rules, approve an Australian Naval Classification Basis for each naval vessel, and issue Australian Naval Classification Certificates for all naval vessels operated by Defence.

The ANC Authority is both an appointed individual and the supporting organisation.

The ANC Authority works in support of the DSwA, distilling both governance, and activity- and condition-based compliance obligations, into materiel requirements. Prescribed solutions to the ANC Rules support the achievement of the seaworthiness outcome and the optimisation of acquisition, design and sustainment.



Relationship of ANCA to the Naval Regulator, the Naval Vessel Operator and the Naval Shipbuilding and Sustainment Group (Diagram courtesy ANCA)

ANCF Implementation

There is ongoing work to develop the ANC Framework, (inclusive of the ANC Rules), in preparation for the ANC Framework rollout including transition of existing maritime capabilities.

ANC Rules Development

Currently ANCA is working through the finalisation of the first three divisions of the ANC Rules:

- Division 1 Australian Naval Classification
- Division 2 Core Design Rules
- Division 3 Ship Rules

In the medium term, the ANCA will work on the development of:

- Division 4 Small Craft and
- Division 5 Remote and Autonomous Systems

In the long term, ANCA will develop:

- Division 6 Support and Deployable Sub Systems
- Division 7 Submarines and Submersible Craft

Proof-of-Concept Activities

Proof-of-concept activities are also underway to inform the application of the ANC Rules and the ANC Framework for both the current and future fleets.

Transition

Transition of existing vessels will occur in a phased approach commencing in Q4 2023, with the aim of minimising the impact on Defence and the defence industry.

To this end, naval vessels will be assessed against the ANC Rules and, where there are gaps in solutions to these rules, a risk assessment will be undertaken. The Capability Mangers (for example Chief of Navy, or Chief of Army) can then decide whether the risk is acceptable and can be managed, or whether the risk is unacceptable and a change to the vessel is required for the rules to be met.

Summary

There was a need for Australian Naval Classification design rules and standards. This led to the establishment of the Australian Naval Classification Authority, and the ANC Framework. This has been applied through a common operating model, and implementation across Defence will minimise the impact on defence and industry.

Questions

Question time was lengthy and robust, and raised many more interesting points.

The presentation was not recorded.

The vote of thanks was proposed, and the “thank you” bottle of wine was presented, by Steve Morant. The vote was carried with acclamation.

Colin Dagg (L) and Steve Morant (Photo Phil Helmore)

Phil Helmore

SS *President Coolidge*: Sinking and the Shipwreck

Carl Linkenbagh, a Senior Systems Engineer working within the Department of Defence on maritime projects, gave a presentation on *SS* President Coolidge*: Sinking and the Shipwreck* to a joint meeting of the NSW Section and IMarEST ACT & NSW Branch at the Royal Prince Edward Yacht Club, Point Piper, with the Secretary of the IMarEST, Geoffrey Fawcett, as MC and streamed live on 4 October. The presentation was attended by 15 with an additional 13 online.

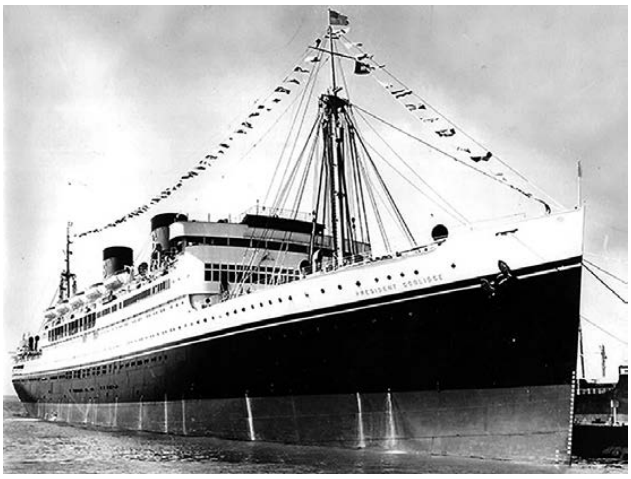
The Ship

SS *President Coolidge* was one of two luxury passenger ships (the other being *President Hoover*) built by Newport News Shipbuilding and Drydock Company of Newport News, VA, for Dollar Steamship Lines. The keel for *President Coolidge* was laid on 22 April 1930 and the ship was delivered on 1 October 1931. *President Hoover* was completed in 1930. They were the largest and most advanced merchant ships built in the United States up to that time.

Launching of SS *President Coolidge*
(Photo courtesy Todd Neitring)

Principal particulars of the vessels were:

Length OA	654 ft (199 m)
Beam	81 ft (24.7 m)
Depth	52.0 ft (15.8 m)
Draft	34 ft (10.4 m)
GT	21 936
Passengers	307 First class
	133 Tourist class
	548 Third class
	988 Total
Crew	324
Power	Westinghouse turbo-electric 26 500 shp (19 760 kW)
Boilers	12×Babcock & Wilcox watertube 300 psi (2070 kPa)
Propellers	2×fixed pitch, 3 blade
Speed (maximum)	21 kn
Range	19 500 n miles (at cruising speed)



SS *President Coolidge*
(Photo from ocealinersmagazine.com website)

Peacetime

President Coolidge and *President Hoover* were home-ported in San Francisco and ran regular trans-Pacific voyages to the Philippines (Manila), China (Shanghai) and Japan (Kobe) via Honolulu, with occasional round-the-world voyages which continued westbound from Manila via Singapore, the Suez Canal, the Mediterranean Sea, New York City, the Panama Canal and thence back to San Francisco.

The vessels were designed specifically to accommodate American holiday makers seeking sunshine and adventure in the Pacific and Far East and were among the first purpose-built passenger ships intended primarily for leisure voyages, in contrast to the much larger and faster ocean liners operating line voyages between Europe and North America on the lucrative North Atlantic route. Passenger luxuries included spacious staterooms and lounges decorated in the highly fashionable art deco style of the time, private telephones, two saltwater swimming pools, a barbers' shop, beauty salon, gymnasium and soda fountain.

Stair on SS *President Coolidge*
(Photo from TDI Blog website)

Dining room on SS *President Coolidge*
(Photo from TDI Blog website)

Lounge room on SS *President Coolidge*
(Photo from TDI Blog website)

President Coolidge set a new eastbound speed record of 12 days from Yokohama to San Francisco in April 1931, and a further eastbound speed record of 4 days from Honolulu to San Francisco in January 1933.

Following a minor collision with the tanker *Frank H. Buck* in San Francisco in March 1937, the Dollar Steamship Company entered administration (via US Government takeover) in March 1938. *President Coolidge,* with all former Dollar Line vessels, was transferred to American President Lines by August 1938, as recognised by the United States Maritime Commission.

World War II

In June 1941, with the war in Europe well underway and the likelihood of war in the Pacific with Japan increasing by the day, the US War Department requisitioned *President Coolidge* as a troop transport vessel reinforcing garrisons in the Pacific. On 7 December 1941 Japan attacked Pearl Harbor and on 19 December *President Coolidge* evacuated 125 critically injured naval patients from Hawaii, reaching San Francisco on 25 December.

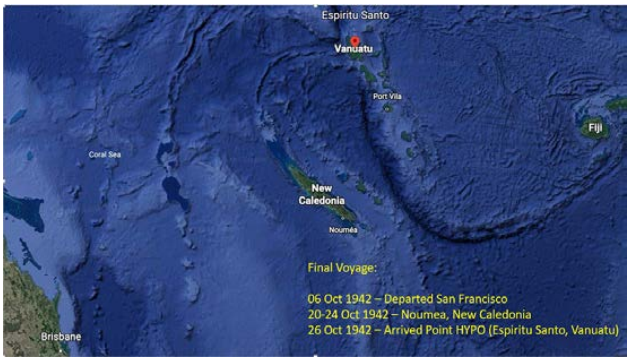
President Coolidge continued to perform military duties in her pre-war civilian condition. Only in early 1942 was she hastily converted into a troopship. Many of her civilian fittings were either removed for safe keeping or boarded over for their protection. Her accommodation was reorganised to provide capacity for 5000 troops. 3 inch (75 mm) guns were mounted, she was painted haze gray and the War Shipping Administration operationally assigned her to the US Navy for troop transport voyages between the US and forward bases in the Pacific

The Sinking

The Pacific in late 1942 was the stage for one of the most intense periods of naval warfare in maritime history. The allied campaign at the time was focussed on repelling the Japanese advance across the Pacific and this resulted in many fierce naval battles. It was this theatre of war that *President Coolidge* was bound for when she departed San Francisco for the final time on 6 October 1942 under the command of Captain Henry Nelson (American President Lines). On board were approximately 5000 troops and cargo holds packed with vehicles, weapons, provisions, medical equipment and other supplies vital to the war effort.

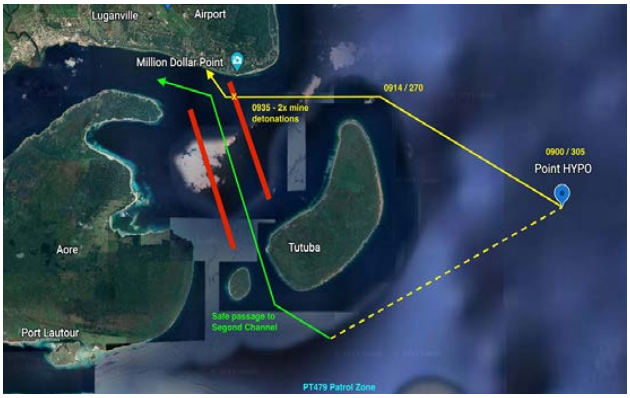
Following a four-day visit to Noumea (New Caledonia), where she arrived on 20 October 1942, the ship sailed for the island of Espiritu Santo on 24 October 1942. Her destination was Point HYPO, a code-worded rendezvous position to the south-east of the approaches to the Segond Channel. Espiritu Santo, the largest island in Vanuatu (then known as the New Hebrides), was the site of a large military base and harbour which quickly became a vital strategic asset in the allied Pacific campaign. It was noteworthy for its airfields and the deep-water anchorage which provided a secure port for the repair and re-supply of allied merchant and warships.

From mid-1942 the entrances to the Segond Channel were heavily protected by mines laid in two lines across its deep-water approaches, with a ‘safe’ (or swept) channel maintained for ships between the islands of Aore and Tutuba.



Location of Vanuatu
(Chart courtesy Carl Linkenbagh)

Vanuatu, Aore and Tutuba Islands
(Chart courtesy Carl Linkenbagh)



Minefield and vessel's track
(Chart courtesy Carl Linkenbagh)

However, as he approached Point HYPO at 0900 on the morning of 26 October 1942, Captain Nelson had not been briefed on the minefield, safe passage or pilotage requirements for entry into the Segond Channel by the US Navy. It had been decided by local military commanders that a merchant ship captain had no requirement to be briefed on the location of the minefields in the interests of maintaining operational secrecy.

On arrival at Point HYPO, Captain Nelson assessed his options for bringing the ship safely into the anchorage. In the absence of an escort, pilot, further orders and/or instructions—and with a legitimate concern of enemy submarines operating in the immediate area—he maintained full speed and steered for the eastern entrance of the Segond Channel between Espiritu Santo and Tutuba, which was the nearest, deepest and widest entrance into the anchorage beyond.

Unaware of the danger lurking below, the ship made a turn to port at 0914 off Tutuba Island heading due west, placing the minefield dead ahead. At approximately 0935 a US Navy shore station in the vicinity of Million Dollar Point urgently signalled *President Coolidge* (via flashing light) "STOP. YOU ARE STANDING INTO MINES". Instantly, Captain Nelson ordered the main engines crash stopped in an effort to stop the ship. However, this was to no avail.

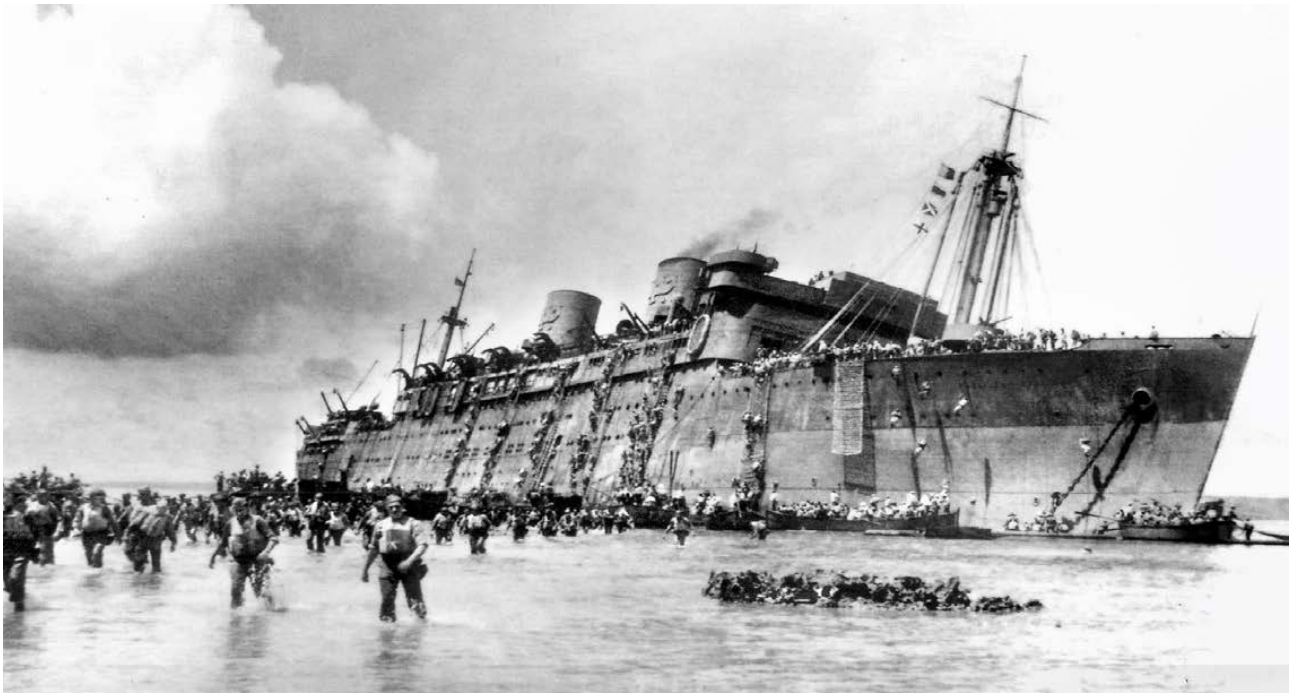
President Coolidge struck two mines on the outer line of the minefield, both of which breached the engine room and aft machinery spaces. The ship immediately began to flood, was losing headway and took on a list to port.

Captain Nelson rapidly assessed the situation. He ascertained very quickly that the ship was seriously damaged. At 0938 he ordered a hard turn to starboard and aimed the bow of the ship directly at the northern shore of the Segond Channel, with the intention of running her hard aground and preventing her sinking. As the bow rode up on the reef he gave the order to abandon ship. What followed was an orderly, unfussed evacuation of over 5000 persons onboard, many of whom did not even get their feet wet as they were landed ashore. All but two persons were safely disembarked from the ship.

What Captain Nelson was less aware of was that under the stern of the ship was 70 m of water and the fact that the seabed dropped sharply at a steep angle from where the bow was grounded. As the evacuation progressed, the ship continued to flood. Her list increased to the point where, at 1052, she rolled over completely on her port side and sank stern first to the bottom of the channel, sliding down the steep underwater slope in the process.

The immediate aftermath of the sinking was significant, noting that there were now 5000 troops ashore in Santo with nowhere to go and inadequate resources ashore to support them. Not to mention the fact that thousands of tons of valuable cargo, including the entire supply of quinine—the only available treatment for malaria—for the South Pacific, was now lost and totally inaccessible on the seafloor.

Following the incident there were two separate Boards of Inquiry and a Military Commission, both of which found—having regard to all of the circumstances—that Captain Nelson was not at fault. It is notable that Admiral William F.



Abandon ship!
(Photo from RNZI website)

Halsey USN attempted to deflect liability away from the US Navy; however, Captain Nelson's actions on the morning of 26 October 1942 were fully vindicated and he was acquitted of responsibility for the sinking.

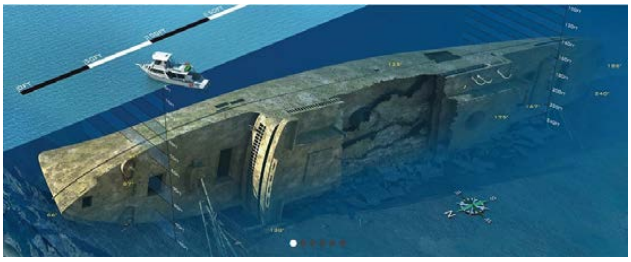
After World War 2 *President Coolidge* was largely forgotten by her owners and the US Government. Excluding some initial attempts at equipment salvage during the war, the ship lay mostly undisturbed on the seafloor until commercial salvagers arrived in the late 1960s. Numerous salvage efforts resulted in removal of both propellers, spare propeller blades, bunker oil and sources of valuable metals such as brass casings of shells, electric motors, metals from the engine room, junction boxes and copper tubing and fittings. Numerous artefacts in the form of personal and decorative items have also been removed. These salvage attempts have made an indelible mark on the wreck.

Fortunately, a moratorium on further salvage was declared by the Government of Vanuatu on 18 November 1983 and the wreck was preserved as a historic site which is now accessible to recreational scuba divers.

The Wreck Today

Today, *President Coolidge* lies silently on her port side at depths ranging from 21 m (at the bow) to 70 m (at the stern). The wreck is located near the eastern entrance to the Segond Channel, approximately 6 km from the town of Luganville.

The hull of the ship is largely intact; however, after 81 years on the seafloor, the superstructure has almost totally collapsed, as has some of her internal structure. This is primarily due to the effects of several earthquakes. However, the ship is remarkably complete and diving her offers a direct insight into a vessel with a fascinating history.



The wreck today
(Diagram courtesy Carl Linkenbagh)

Bow of the ship at 21 m
(Photo courtesy Carl Linkenbagh)

The bow anchor
(Photo courtesy Carl Linkenbagh)

The presenter emulating Kate Winslett on the bow of *Titanic*
(Photo courtesy Carl Linkenbagh)

Gun mounting on the main deck
(Photo courtesy Carl Linkenbagh)

Diving the Wreck

Diving *President Coolidge* is an exceptional experience. This is largely due to the immense scale of the ship, the huge variety of things to see (both natural and man-made) and the complexities and risks involved in diving her. Since recreational diving on the wreck was pioneered by the late Allan Power from the mid-1980s, *President Coolidge* has become an iconic, must-see destination for divers from all over the world. There are wartime artefacts to be seen on every dive such as guns, cannons, jeeps, helmets, trucks and personal supplies and remnants of her luxurious art deco past which includes an iconic porcelain relief statue of "The Lady" (a must-see item for any diver visiting the wreck), chandeliers, and a mosaic tile fountain.

Propeller shaft and rudder
(Photo courtesy Carl Linkenbagh)

The Lady
(Photo courtesy Carl Linkenbagh)

Jeep in No. 2 cargo hold
(Photo courtesy Carl Linkenbagh)

Exploring a passageway with light through portholes
(Photo courtesy Carl Linkenbagh)

Clown fish at the 6 m decompression stop
(Photo courtesy Carl Linkenbagh)

Turtle at the wreck
(Photo courtesy Carl Linkenbagh)

The ship has also become a spectacular marine habitat and the permanent home of many resident creatures such as reef fish, barracuda, lionfish, sea turtles, moray eels and various types of coral. One of the more spectacular dives on the wreck is a night dive into No. 2 Cargo Hold. At a depth of approximately 25–30 m, you enter the vast, cavernous space. Lights are turned off and everything is pitch black until schools of bioluminescent fish emerge, creating a mesmerising spectacle.

Another remarkable attribute is the wreck's accessibility and the ease with which she can be accessed. *President Coolidge* is without doubt one of the most spectacular shore dives anywhere in the world. The water is a very comfortable 28°C, visibility is typically in the order of 15–20 m with calm surface conditions, Santo's natural beauty is all around and, after the day's diving is done, there is an abundance of fresh fruit, kava, Tusker beer and good humour from Santo's very friendly locals whose clocks are always set to 'island time'.

Nowhere else in the world is diving such an immense and historically-significant shipwreck so easy and enjoyable. The presenter has now made 22 dives on this wreck (down to a maximum depth of 55 m) and is going back for more!

Dive Profile

The average dive time is approximately 55 min ±10 min. Recreational dives are conducted on air (i.e. 21% oxygen in order to manage oxygen partial pressure within acceptable limits) and are led by highly-experienced, local dive guides following well-established routes both inside and outside the wreck.

A typical dive profile within the 30–40 m range includes:

1. descent from the surface to the 'deco area' (6 m) and then to the bow (21 m) — 5 mins;
2. bottom time — up to 10 min at maximum depth;
3. ascent to the 'deco area' from maximum depth (whilst swimming 'up' the wreck) — up to 25 min; and
4. decompression at 6 m (with deeper stops as required) — up to 25 min.

All dives on the wreck, even for recreational divers, typically result in a decompression obligation due to depth and accumulated bottom time. It is advisable for anyone considering diving *President Coolidge* at any level to remain within the limits of their own training, experience and self-assessed level of competency.

The wreck is an ideal location for technical diving and these skills are essential for any dives beyond recreational limits. Technical dives—which extend below 40 m, incur mandatory decompression obligations and may require the use of mixed gases (such as Trimix 21/35 or 18/45)—enable access to deeper parts of the wreck down to a maximum depth under the stern of 70 m. Deeper parts of the wreck are far less travelled and seeing the ships' graceful counter stern, enormous rudder and propeller shafts is a spectacular and unforgettable sight.

Conclusion

President Coolidge is the largest shipwreck accessible to recreational divers in the world.

Appropriate qualifications and experience are essential to dive the wreck due to the cumulative risk associated with depths, dive profiles, decompression obligations, and complex wreck penetrations—all at the same time.

It is a magnificent and awe-inspiring experience because of the wreck's accessibility, enormous size, the huge variety of things to see and the opportunity to connect with history.

Diving *President Coolidge* pushed the presenter right to the limit of his training, experience and comfort zone—and beyond—and he can't wait to go back and do it again!

Questions

Question time was lengthy and elicited some further interesting points.

The presentation was not recorded.

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

Phil Helmore
Carl Linkenbagh

Carl Linkenbagh (L) and John Jeremy
(Photo Phil Helmore)

INDO PACIFIC 2023 EXPOSITION

The Indo Pacific 2023 International Maritime Exposition was held at the International Conference Centre Sydney at Darling Harbour on Tuesday 7 to Thursday 9 October.

The Exposition comprised the Exhibition and a busy program including

- International Maritime Conference IMC 2023
- Sea Power Conference
- AAUS (Australian Association for Uncrewed Systems) Conference
- AMDA Foundation's Indo Pacific Hub
- Indo Pacific Innovation Program
- International Radar Conference

Indo Pacific 2023 International Maritime Conference (IMC 2023)

There were 308 registrants for the IMC this year, somewhat fewer than last year, but a pleasing attendance anyway.

The Opening Ceremony for the IMC was held in one of the conference rooms in the ICC and officiated by the Chair of the Organising Committee, John Jeremy AM, who welcomed the attendees.

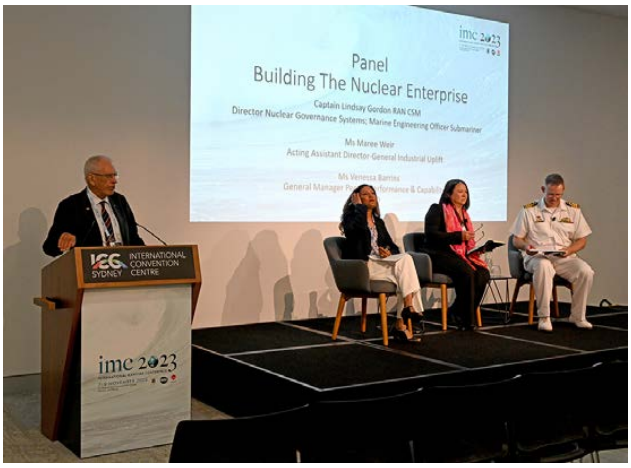
The Opening Address was made by Gwynne Lewis, CEO of the Institute of Marine Engineering Science and Technology.

The Keynote Addresses were made by

- Day 1: Todd Mansell, First Assistant-Director-General of the Australian Submarine Agency.
- Day 2 Tim Speer, Design Development Manager, Austal.
- Day 3 A/Prof. Warren Smith, Naval Architecture Stream Coordinator, UNSW Canberra at ADFA.

Todd Mansell's Keynote Speech at the IMC Opening Ceremony
(Photo Adrian Broadbent)

The number of papers submitted for consideration was twice what could reasonably be accommodated. A total of 68 papers and two panel discussions on *Building the Nuclear Enterprise* and *The Opportunities and Challenges for Accelerating Autonomous Systems into Australian Defence Force Capability* in two (and occasionally three) parallel streams were presented. The conference program can be seen on the Pacific 2023 IMC website.



John Jeremy introducing the members of the first panel session: Building the Nuclear Enterprise
(Photo Adrian Broadbent)

A feature of the International Convention Centre is the nautical-mile distance between the Conference Halls and the Exhibition Hall. This meant that delegates received their daily exercise with treks between conferences, morning teas and lunches, and visits to the exhibitions! The boxed lunches which were introduced for the pandemic last year were continued this year.

It was good to see delegates to the IMC from all Australian states and international, as well as naval architecture students from UNSW Canberra at ADFA along with their lecturers, Warren Smith, David Lyons, Sean McCraken and Richard Dunley and from the Australian Maritime College along with lecturers Gregor Macfarlane, Vikram Garaniya and Jonathan Duffy.

IMC Welcome Function

The Welcome Function for the IMC was held in the Terrace Room at the Australian National Maritime Museum, on the evening of Wednesday 8 November. Speeches were limited to the welcome by the Chair of the IMC 2023 Organising Committee, John Jeremy, and short addresses by Scott Hare, Manager: Engineering, Teekay Shipping (Australia) who sponsored the function, VADM Tim Barrett AO CSC RAN (Retd), Convenor of Indo Pacific 2023, and Romilly Madew, CEO of Engineers Australia. Champagne, white and red wine, beer and finger foods were served throughout the evening for the delectation of the guests, and many tall tales and true were told.

VADM Tim Barrett addressing the Welcome Function
(Photo Adrian Broadbent)

The UNSW Canberra contingent at the IMC: A/Prof. Warren Smith, Brett Murray (4th Year ME student and presenter), SBLT Cooper Woods (4th Year NA student and presenter), Sean McCracken (behind), MIDN Thandi Murada, MIDN Scarlett Lockyer , Lauren Kemp, MIDN Keelin Dailey (USN exchange student), David Lyons, Dr Richard Dunley and MIDN James Scotson
(Photo courtesy Warren Smith)

Indo Pacific 2023 Exhibition

The Exhibition was held in the Exhibition Hall at the ICC, and there were more than 800 exhibitors this year, taking up all four halls of the exhibition space, a new exhibitor record! Exhibitors included Australian designers, builders, manufacturers, researchers, state representatives, and designers, builders and manufacturers from the UK, USA, Spain, Italy, New Zealand…..the list goes on.

Ocius Technology's Bluebottle *BB705* for the RAN
(Photo John Jeremy

Displays included the Sentinel 1100 HDPE (high density polyethylene) craft, designed specifically for defence and security applications by One2three Naval Architects and built by Sentinel Boats in Hobart, and the fifth and final one of Ocius Technology's latest Bluebottles, *BB705,* for the Royal Australian Navy.

One2three Naval Architects' Sentinel 1100
photographed at Woolwich
(Photo courtesy David Salter)

The exhibition halls were very busy for the three days
of Indo Pacific 2023
(Photo John Jeremy)

RINA Stand at Indo-Pacific 2022 Exhibition

RINA had a stand at the Exhibition which was crewed almost continuously throughout the Exhibition by the Secretary of the Australian Division, Rob Gehling, the Chair of the NSW Section, Belinda Tayler, together with Australian members of RINA attending the IMC and who volunteered their time. Thanks to Lauren Stotz, John Lane, Rob Hayes, Adrian Broadbent, Andy Harris, Karl Slater, Phil Helmore, Roger Ramsay, David Cox and Jonathan Binns.

Belinda Tayler speaking with a visitor at the Institutions' stand (Photo John Jeremy)

IMC Closing Ceremony

The Closing Ceremony for the IMC was officiated by John Jeremy AM, who thanked

- the members of the IMC Organising Committee and the Program Committee for their hard work;
- Serena Davey of AMDA, who organised the IMC, and was the power behind making it all work so smoothly; and
- all the attendees for their participation and contributing to the success of the event.

Bob Campbell Prize 2023

The Bob Campbell Prize is for the best written paper submitted *and* presentation made at the Indo Pacific International Maritime Conference, and commemorates the man who was instrumental in the original formation of this series of conferences, and Chaired the inaugural Pacific Organising Committee in 2000.

The announcement of the Award was made at the Closing Ceremony of the IMC by Rob Gehling, RINA Vice President, Pacific Region, RINA Secretary, Australian Division, and member of the IMC Program Committee, who said that the selection of the winner from the 68 papers presented was particularly difficult. The IMC Papers Committee assessed the papers submitted and winnowed the contenders to a short list of ten. These ten had two members of the Papers Committee present at each presentation for assessment of the presentations themselves. The finalists came down to a short list of two, with only percentage points between them!:

Sammy Tweddle	*Shipbuilding and Sustainment—Roadmap for Nuclear Suitably Qualified Experienced Persons: Accident Investigation of the K-431 Submarine Reactor and the Importance of a Nuclear Safety Culture*
Blake Burgess	*The Impacts of Operational Environments on Blast Survivability and Operability Performance*

and the winner was Blake Burgess.

Blake was not present at the Closing Ceremony, and it is expected that the presentation will be made at an appropriate RINA occasion.

Phil Helmore

At the Welcome Function: Don Moloney (IMC Organising Committee, representing EA), Bruce Howard (OC, EA), Tauhid Rahman (OC, IMarEST), Rob Gehling AO (Program Committee, RINA), John Jeremy AM (Chair OC), Adrian Broadbent (Chair Program Committee, RINA), Jim Black (President RINA Australian Division), Geoffrey Fawcett (OC, IMarEST) and Stuart Cannon (OC, RINA) (Photo courtesy Don Moloney)

Energy Efficiency Existing Ship Index

In June of 2021, the IMO Marine Environmental Protection Committee (MEPC) held its 76th meeting. During that meeting the committee adopted resolution MEPC.328(76) containing amendments to MARPOL Annex VI concerning mandatory goal-based technical and operational measures to reduce carbon intensity of international shipping.

One of these measures includes the Energy Efficiency Index for Existing Vessels (EEXI), which will be applied retroactively to vessels above 400 GT falling under MARPOL Annex VI through a one-time certification. These amendments entered into force on 1 November 2022.

So, beginning 1 January 2023, an EEXI technical file needs to be in place for vessels satisfying the Required EEXI. The EEXI technical file includes the EEXI calculation with supporting documentation, and must be submitted to a classification society prior to the International Energy Efficiency (IEE) survey taking place. Issuing of the IEE certificate takes place upon verification of the EEXI during the next scheduled annual, intermediate or renewal survey in the year 2023.

ABS Regulatory News

ABS Classes World's First Green Methanol-powered Containership

ABS joined Maersk and global dignitaries for the official naming ceremony of *Laura Maersk,* the first containership ever to sail on green methanol, a Maersk feeder vessel built to ABS Class. Ursula von der Leyen, President of the European Commission, served as the vessel's sponsor, christening *Laura Maersk*, following tradition, with a bottle of champagne.

Laura Maersk launching ceremony
(Photo courtesy Maersk)

The 32 300 dwt feeder vessel is the first of 19 dual-fuel-engined vessels which can sail on green methanol on order from Maersk to ABS Class. When all 19 vessels on order are deployed and have replaced older vessels they will, when operating on green methanol, generate annual CO_2 emissions savings of around 2.3 million tonnes.

"As *Laura Maersk* enters service, this is a watershed moment for the industry, proving the innovation and dedication of Maersk to support decarbonisation technologies. It is also a moment to mark the industry-leading efforts of ABS to assist clients with services and solutions to reduce emissions and enable more sustainable operations," said John McDonald, ABS President and COO.

"I want to thank the American Bureau of Shipping for helping us turn a vision into reality and being a significant part of this journey for *Laura Maersk*. A.P. Moller-Maersk wants to accelerate the green transition in shipping and logistics and to do so, we need strong involvement from partners across the industry," said Leonardo Sonzio, Head of Fleet Management and Technology at Maersk.

ABS has published guidance on Methanol as Marine Fuel, evaluating the challenges in the design and operation of methanol-fuelled vessels. A copy of *Sustainability Whitepaper: Methanol as Marine Fuel* may be downloaded from the ABS web site.

ABS News, 20 September 2023

DNV Launches new Guidelines for On-board Carbon-capture Systems on board Ships

DNV has published new guidelines for the safe installation of on-board carbon-capture and storage (OCCS) systems on board ships, amid growing pressure on the shipping industry to develop effective technologies to reduce emissions as part of the ongoing maritime energy transition.

Different methods for reducing greenhouse gas (GHG) emissions will be necessary to achieve international, regional, and national emissions targets. Post-combustion OCCS on board trading ships is expected to be among these future solutions, especially on vessels where the use of alternative fuels is not feasible.

DNV's new guidelines are designed to be used by stakeholders across the value chain, including ship designers, builders, OCCS system manufacturers and ship owners, and apply to both newbuilds and retrofits. They cover all aspects for safe installation, including exhaust pre-treatment, absorption with the use of chemicals/amines, after-treatment systems, liquefaction processes, CO_2 storage, and transfer systems.

"Our new guidelines for onboard OCCS systems aim to support the industry as it faces strict requirements for emissions reduction. A focus on safety is crucial for new technology and must be prioritised as the industry looks to adopt sustainable fuels and CCS installations," said Chara Georgopoulou, Head of Maritime R&D and Advisory Greece, Senior Research Engineer II, Onboard CCS Manager. "While CCS technology is already known in land-based industry, its application on board ships is relatively unproven. Our guidelines provide a framework for installation, offering support for stakeholders in the industry, while contributing to reducing emissions and driving the maritime industry towards a more sustainable future."

While the guidelines are based on DNV classification requirements, additional technical or other requirements may be imposed by relevant flag-state administrations. There are currently no statutory regulations addressing the possible safety implications of using OCCS systems on board ships. The guidelines also cover alternative solutions for carbon capture, including physical absorption and cryogenic methods.

DNV`s guidelines were published in September, and may be accessed from

https://www.dnv.com/news/dnv-has-launched-new-guidelines-for-onboard-carbon-capture-systems-on-board-ships-247921

(DNV Veracity login required).

DNV News, 9 October 2023

New SOLAS Chapter XV: Safety Measures for Ships Carrying Industrial Personnel

The International Maritime Orgaisation (IMO) has adopted a new mandatory International Code for Safety for Ships Carrying Industrial Personnel (IP Code)*. It is mandated through a new Chapter XV# in SOLAS, which enters into force on 1 July 2024.

SOLAS defines "industrial personnel" (IP) as persons transported or accommodated on board for the purpose of offshore industrial activities performed onboard other ships and/or offshore facilities (such as wind farms and oil rigs).

Application

The new code applies in its entirety, on or after 1 July 2024, to cargo ships and high-speed cargo craft which are:

- of 500 GT and upwards;
- engaged on international voyages;
- carrying more than 12 industrial personnelϕ;
- constructed (keel laid) on or after 1 July 2024; or
- existing vessels which are not certified to carry industrial personnel prior to 1 July 2024.

A reduced version of the code will apply to vessels authorised to carry industrial personnel prior to 1 July 2024 (see below).

A prerequisite for the applicability of SOLAS Chapter XV and the IP Code is that a vessel has SOLAS cargo ship certificates or high-speed craft code certificates, as applicable.

Flag Administrations may allow certification to the IP Code for non-convention vessels, i.e. those less than 500 GT or not engaged on international voyages.

Authorisation Prior to July 2024

Prior to the IP Code entering into force on 1 July 2024, vessels have the option to request authorisation from the flag Administration to carry more than 12 industrial personnel, based on the Interim recommendations on the safe carriage of more than 12 industrial personnel onboard vessels engaged on international voyages [Resolution MSC 418(97)].

Such vessels can then gain IP Code certification after 1 July 2024 by complying with some additional requirements for training, safe personnel transfer, life-saving appliances and dangerous goods. These additional requirements on cargo ships need to be evaluated before the first intermediate or renewal survey, whichever occurs first, after 1 July 2024. For high-speed cargo craft, the evaluation has to take place before the first renewal or third periodical survey, whichever occurs first, after 1 July 2024.

SPS Code Vessels

Vessels constructed before 1 July 2024, operating with a large number of persons on board and which have not been certified in accordance with Code of Safety for Special Purpose Ships, 2008 (2008 SPS Code) or MSC. 418(97), may have difficulty complying with the IP Code if they wish to carry more than 12 industrial personnel after 1 July 2024.

Vessels built under the 1984 SPS Code—Resolution A.534(13), which are currently carrying special personnel (SP) and industrial personnel, but have no authorisation from their Administration to confirm that they are allowed to operate in line with Resolution MSC.418(97), may have difficulty complying with the stability requirements from the IP Code.

What Should Shipowners and Ship Managers do Now?

For vessels constructed before 1 July 2024 and wanting to carry more than 12 industrial personnel, early engagement with the Flag Administration is encouraged to request authorisation in accordance with the interim recommendations on the safe carriage of more than 12 industrial personnel onboard vessels engaged on international voyages (Resolution MSC.418(97)).

* IP Code is published as Resolution MSC.527(106)

SOLAS amendments published as Resolution MSC.521(106)

ϕ The number of industrial personnel is the aggregate number of industrial personnel, special personnel and passengers carried on board (where the number of passengers shall not exceed 12).

LR Class News, 13 October 2023

LR's Zero-carbon Fuel Monitor

The Lloyd's Register Maritime Decarbonisation Hub's October 2023 update of the Zero Carbon Fuel Monitor appraises the readiness levels of seven key candidate fuels/energy sources across the fuel supply chains from perspectives of technology, investment and community readiness: ammonia, biodiesel (FAME), electrification, hydrogen, methane, methanol, and nuclear energy.

This report presents insights derived from the latest update of readiness levels within the Zero Carbon Fuel Monitor, offering an overview of trends, priorities and recommended actions to drive the adoption of zero-carbon fuels in the shipping industry.

In the report, specific supply-chain actors have been identified who can act upon these priorities. However, tackling these cannot be achieved through individual efforts or action in isolation within the shipping industry. The report observes the interconnectedness of all stakeholders and underscores the need for collective action to drive forward and accelerate the transition.

The report may be downloaded from

https://www.lr.org/en/knowledge/research-reports/zero-carbon-fuel-monitor-oct-2023/

LR Research Report, 12 October 2023

FROM THE CROWS NEST

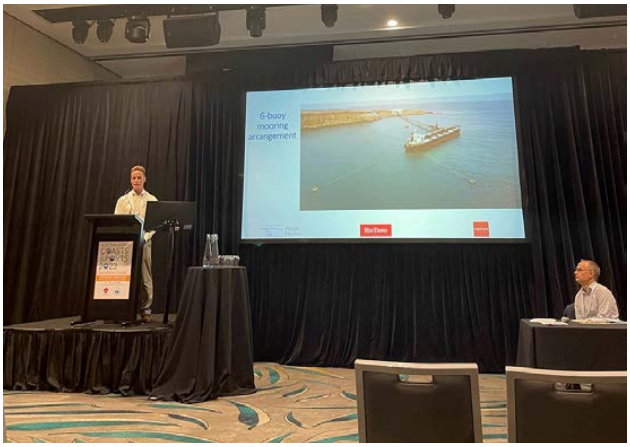
Coasts and Ports Conference 2023

The two-yearly Coasts and Ports Conference 2023 was held at the Novotel Sunshine Coast Resort, Twin Waters, Qld from 15–18 August 2023. Australian and international naval architects presented a variety of topics relating to ships in ports and port-approach channels. Some of the shipping-related presentations included:

- Jordan Butler, WGA: *Loose ends—computational modelling of mooring-line snapback paths*
- Shaun Denehy, Australian Maritime College: *The effect of hullform on berthed ship–passing ship interaction*
- Tim Gourlay, Perth Hydro: *Dynamic mooring analysis of six-buoy spread-moored ships at Cape Cuvier*
- Andy Hartley, Maritime and Civil: *Australia's largest superyacht berth, Gold Coast, Qld*
- Giles Lesser, OMC International: *Big data for ports, pilots, planners and engineers*
- Harry Sunarko, Fortescue Energy: *Port infrastructure planning and design for green hydrogen and its derivatives*
- Wim van der Molen, Baird Australia: *Design of fairways in estuaries with mobile mega bedforms*

The published papers of all presentations will be available soon on the conference website www.coastsandports2023.com.au.

Tim Gourlay



Tim Gourlay presenting at Coasts and Ports Conference 2023
(Photo courtesy Harry Sunarko)

New Spirits on Schedule

The Spirit of Tasmania replacement vessels are taking shape in Finland.

TT-Line has released drone footage of the new *Spirit of Tasmania IV*, currently under construction at the Rauma Marine Constructions shipyards. The vision shows the hull approaching completion as well as the ship's bridge under construction in a separate part of the shipyard.

TT-Line's CEO, Bernard Dwyer, said *Spirit of Tasmania IV* is on schedule to arrive in the first quarter of next year and starting on the Devonport-to-Geelong run by July.

Construction has also started on *Spirit of Tasmania V*, due for delivery towards the end of next year.

The drone video may be viewed at

https://spiritoftasmania.sharefile.com/d-s7eea80d5a0b34cc0becf950459e85564

Spirit of Tasmania IV was named by Deborah Grainger and launched on 27 October 2023. The new ship will be 212 m long with a beam of 31 m. At 48 000 GT she will be able to carry 1800 passengers at a maximum speed of 26 kn.

Sea FM Devonport website

Spirit of Tasmania replacement vessels
(Image from Sea FM Devonport website)

WSR Spirit 2

On 8 October 1978, 45 years ago, Ken Warby blasted across Blowering Dam to set his second (and current) Unlimited World Water Speed Record of 317.6 mph (511.1 km/h).

Dave Warby of Warby Motorsport is attempting to break his father Ken's Water Speed Record in their latest vessel, *Spirit of Australia 2.*

The Warby Motorsport team was back on the water at Blowering Dam on the weekend of 9–10 September to try out their latest modifications to the vessel. They had mixed conditions over the weekend, with strong winds on the Saturday but still managed a run of 185 mph (298 km/h). Better weather on the Sunday enabled several runs over 250 mph (402 km/h), with the best at 261 mph (420 km/h). Recent improvements to the boat have greatly improved the handling, and they are now satisfied with the trim.

The team is scheduled to return to Blowering Dam on the weekend of 18–19 November to continue testing and ramping up the speed towards the record.

Phil Helmore
Martin Grimm

Spirit of Australia 2 at home in Newcastle, being readied for the trip to Blowering Dam for 9–10 September
(Photo from Warby Motorsport Facebook page)

The *SoA2* team preparing for another run
(Photo courtesy Martin Grimm)

SoA2 being lowered into the water for another run
(Photo courtesy Martin Grimm)

WSR *Longbow*

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

Construction slowed during August, with the lead-up to the wedding of David and Julie Aldred's youngest daughter, but picked up again in September. Principal tasks completed have been bulding the aft ends of the sponsons, sourcing and fixing two alloy intake spinners (bullet-shaped nose cones) for the front of each of the twin Viper jet engines which will power the vessel, painting the inside of the boat's hull with three coats of epoxy, and final fitting of the engine cradle and the engines themselves into the hull.

Longbow website

Painting the inside of *Longbow*'s hull with epoxy
(Photo from Longbow website)

Constructing the aft end of the starboard sponson on *Longbow*
(Photo from Longbow website)

Engine cradle refitted to *Longbow*'s hull after painting
(Photo from Longbow website)

Engines fitted to *Longbow*'s hull
(Photo from Longbow website)

SP80 Aims for World Sailing Speed Record

The world sailing speed record is currently held by Australian Paul Larsen in *Vestas Sailrocket 2* at an average speed of 65.45 kn (121.1 km/h) over the 500 m track.

SP80 is the vessel being designed and built by engineering students from the Swiss engineering school École Polytechnique Fédérale de Lausanne (EPFL) to attempt the world sailing speed record and take it back to Europe. They are aiming for a speed of 80 kn (148 km/h) using a boat with shaped hulls, propelled by the usual kite wing, while the overall stability is achieved via super-ventilating hydrofoils.

SP80 has now been fully assembled, has left the workshop and hit the water for the first time on Lake Geneva. In addition to being the culmination of years of work, this launch was the first step of a new adventure: after years on screens, it's time to get practical! For the first test session on Lake Geneva, the vessel was towed behind a motorboat so that they could measure the hull's drag and make sure that the data collected matched their previous calculations. And she did well!

The team and boat have subsequently arrived in Leucate (France), and a new part of the challenge has begun. The next few months will be dedicated to optimising the boat: first they have to learn how to pilot this unique vessel and sail it with a small kite. Then, they'll gradually increase the kite's size and thus the boat's speed. These are exciting times ahead!

SP80 website

SP80 being launched on Lake Geneva
(Photo from SP80 website)

SP80 being towed on Lake Geneva
(Photo from SP80 website)

Sail GP Series 4

The Australia SailGP Team has now won the coveted SailGP Trophy three times, winning it in Seasons 1, 2 and 3.

Series 4 kicked off in Los Angeles, USA, on 22–23 July, with Australia, Great Britain, Canada, Denmark, France, Germany (a newcomer), New Zealand, Spain, Switzerland and USA all competing.

Subsequent events have been held in Saint Tropez (France) 9–10 September, Taranto (Italy) 23–24 September and Andalucia-Cadiz (Spain) 14–15 October. Results show Australia currently at the top of the table with 43 points., Denmark 2 with 36 and USA 3 with 32.

There are eight venues remaining to complete the series, as follows:

Dubai	9–10 December
Abu Dhabi	13–14 January
Sydney	24–25 February
Auckland	23–24 March
Bermuda	4–5 May
Halifax	1–2 June
New York	22–23 June
San Francisco	13–14 July

For all the details, visit the Sail GP website at https://sailgp.com.

Phil Helmore

ASRG Dockmaster Training Course

The ASRG Dockmaster Course is a four-day course which covers the fundamentals and calculations required for all aspects of the safe docking and undocking operations of all vessel sizes and types.

The ASRG Dockmaster Course was developed exclusively for the Australian Shipbuilding & Repair Group to suit the needs of the Australian marine industry. The course is delivered face-to-face in a classroom setting with calculations in metric units.

The course is approved by the RINA for Continuous Professional development

The ASRG Dockmaster Course is deemed to qualify for a 100% SADI rebate of course fees for particular SME companies who may qualify as a result of Defence Department engagement.

The next course is scheduled to be conducted at;

ASC, Osborne, SA: Tuesday 19 – Friday 22 March 2024

Other courses will be advised in early 2024 and may include Sydney, Cairns, Henderson and Darwin.

Competitive rates are offered on application with further discounts provided for eligible ASRG member companies and also approved serving Defence Force personnel.

The course is suitable for those engaged in the shipping, shipbuilding or ship repair and related industry sectors, including:

Dockmasters
Naval Architects
Consultants
Owners' Representatives
Shipyard Managers
Project Managers

For details: Liz Hay, ASRG Chief Executive, at liz.hay@asrg.asn.au or +61 7 5597 3550

ASRG *Australian Shipbuilding & Repair Group*
PO Box 756
ASHMORE CITY QLD 4214

UK Contracts for AUKUS Submarine Design

Contracts worth £4 billion (about $A7.7 billion) placed in the UK on 1 October began the process of the design and manufacture of the world's most advanced submarines.

The signing of the Detailed Design and Long Leads (D2L2) Phase with BAE Systems (BAES), Rolls-Royce and Babcock represents a significant milestone for both the UK and the trilateral AUKUS programme as a whole, in the lead up to build the future class of nuclear-powered attack submarines, known as SSN-AUKUS.

The contracts totalling £4 billion will progress the programme through the design, prototyping and purchase of main long-lead components for the first UK submarines, allowing construction to commence in the coming years and ensure the stability and resilience of the domestic supply chain.

Building on more than 60 years of British expertise in designing, building and operating nuclear-powered submarines, the D2L2 contracts will support thousands of highly-skilled jobs in the UK.

Alongside the design development and long-lead procurement, infrastructure at the submarine shipyard in Barrow-in-Furness and the nuclear reactor manufacturing site in Raynesway, Derby, will be developed and expanded where needed to meet the requirement of the future submarine build programme.

The aim is to deliver the first UK submarines into service in the late 2030s to replace the current Astute-class vessels, and the first Australian submarines will follow in the early 2040s. They will be the largest, most advanced and most powerful attack submarines ever operated by the Royal Navy, combining world-leading sensors, design and weaponry in one vessel.

Construction of the UK's submarines will take place principally in Barrow-in-Furness, while Australia will work over the next decade to build up its submarine industrial base, and will build its submarines in Australia with Rolls-Royce supplying the nuclear reactors for all UK and Australian submarines.

AUKUS Personnel Collaborate on UK Submarines

Representatives from the Australian and US Submarine Support organisations have joined Royal Navy personnel in Faslane, Scotland, for the first time to watch and understand how to maintain nuclear-powered submarines.

Forming an Advance Verification Team (AVT), subject matter experts from all three AUKUS nations have joined British shipyard personnel to develop their understanding of the maintenance and industrial skills required to maintain a nuclear-powered submarine.

Following a similar visit to Pearl Harbor Naval Shipyard in August this year, the AVT learnt about the requirements needed to provide an Australian-based facility which can support both UK and US maintenance activity during a future forward-deployed submarine presence in the region. This visit marks a tangible step forward for AUKUS delivery, driving knowledge-sharing and development in Australia that will be critical to the success of the programme.

Austal Australia Delivers 6th Evolved Cape-Class Patrol Boat

Austal announced on 13 October that Austal Australia has delivered the sixth of eight Evolved Cape-class Patrol Boats (ECCPBs) to the Royal Australian Navy.

The vessel, ADV *Cape Pillar*, was officially accepted by the Commonwealth of Australia at Austal's Henderson shipyard.

Austal's Chief Executive Officer, Paddy Gregg, said that *Cape Pillar* was the third Evolved Cape-class Patrol Boat delivered to the Royal Australian Navy in 2023, continuing an enviable track record of Australian shipbuilding efficiency and productivity.

"The Austal Australia team, collaborating with the Department of Defence, the Royal Australian Navy and our valued supply-chain partners, are very clearly demonstrating what the National Naval Shipbuilding Enterprise is capable of—delivering sovereign capability for Australia," Mr Gregg said.

"ADV *Cape Pillar* is the sixth ECCPB which Austal has delivered in just over 18 months, effectively providing a new capability for the Royal Australian Navy every three months.

"Austal is on track to deliver the remaining two ECCPBs currently under construction at Henderson, Western Australia, in 2024; completing the fleet of eight vessels which are enhancing Australia's maritime security".

The project to construct the eight 58 m aluminium monohull patrol boats for the Royal Australian Navy commenced in May 2020. The first five ECCPBs, *Cape Otway*, *Cape Peron*, *Cape Naturaliste*, *Cape Capricorn* and *Cape Woolamai* were delivered within an eighteen-month period, from March 2022.

The ECCPBs feature new, larger amenities to accommodate up to 32 people, improved quality-of-life systems and advanced sustainment intelligence systems which further enhance the Royal Australian Navy's ability to fight and win at sea. The patrol boats will be utilised for a wide variety of constabulary and naval missions and play a critical role in Australia's national security, as a high-performing, reliable and effective maritime asset.

Austal Australia has delivered the sixth Evolved Cape-class Patrol Boat, ADV *Cape Pillar* to the Royal Australian Navy (Photo Courtesy Austal)

The Austal-built ECCPB ADV *Cape Peron* was berthed in Cockle Bay, Darling Harbour, during Indo Pacific 2023
(Photo John Jeremy)

Austal Delivers 17th Guardian-class Patrol Boat

Austal Australia has delivered the 17th Guardian-class Patrol Boat (GCPB) to the Australian Department of Defence.

The vessel, HMPNGS *Gilbert Toropo*, was then gifted by the Australian Government to the Papua New Guinea Defence Force at a handover ceremony held at HMAS *Stirling*, Western Australia.

The ceremony was attended by Australia's Minister for Defence Personnel and Minister for Veterans Affairs, the Hon. Matt Keogh MP, and Papua New Guinea's Minister for Defence, the Hon. Win Bakri Daki MP.

The new Guardian-class Patrol Boat is the fourth of four vessels to be gifted to Papua New Guinea under the Pacific Patrol Boat Replacement Project, part of the Australian Government's Pacific Maritime Security Program.

Austal's Chief Executive Officer, Paddy Gregg, said that the latest Guardian-class patrol boat completes the fleet of new vessels for Papua New Guinea, with the previous three vessels, *Ted Diro*, *Rochus Lokinap* and *Francis Agwi,* delivered in December 2018, March 2021 and October 2021 respectively.

"Papua New Guinea now has four Guardian-class patrol boats which have added greater capability to the Navy, strengthened Papua New Guinea's maritime domain and are actively contributing to regional maritime security.

"Our warmest congratulations go to Commanding Officer, LIEUT Nathan Tai Tombe, and the crew of HMPNGS *Gilbert Toropo,* and we wish them 'fair winds and following seas' for their journey home and future missions," Mr Gregg said.

Faster than the previous/current Pacific-class patrol boats, with improved seakeeping, better amenities, and an enhanced mission capability—including an integrated RHIB stern launch-and-recovery system— the Guardian-class Patrol Boat provides Papua New Guinea with a much-improved naval asset to carry out border patrols, regional policing, search-and-rescue, and many other operations domestically and internationally.

Austal Australia has delivered the 17th Guardian-class patrol boat to the Australian Department of Defence. HMPNGS *Gilbert Toropo* is the fourth vessel to be gifted to the Papua New Guinea Defence Force
(Photo Department of Defence)

The Pacific Patrol Boat Replacement Project was awarded to Austal Australia in May 2016, with subsequent contract options awarded in April 2018 and November 2022 taking the project to 22 vessels, valued at more than $350 million in total. Papua New Guinea, Fiji, the Federated States of Micronesia, Tonga, Solomon Islands, Cook Islands, Kiribati,

Marshall Islands, Palau, Samoa, Tuvalu, Vanuatu, and Timor-Leste are receiving vessels.

Austal Australia's service centre in Cairns, incorporating a 1200 t (80 m LOA) slipway and a 1120 t mobile boat hoist, provides in-service support for the growing Guardian-class Patrol Boat fleet; with more than 100 people employed in a variety of engineering and sustainment roles in the Far North Queensland city.

Australian Government Working with Industry to Assure the Collins-class submarine

The Australian Government will use an independent assurance activity to inform the life-of-type extension of the Collins-class submarine fleet.

Australia's transition to conventionally-armed nuclear-powered submarines is underpinned by the ongoing availability of the Collins-class submarine capability throughout this transition period. This will require the life of the Collins-class submarines to be extended.

This assurance activity will provide the Government with advice on Defence and industry's current preparedness to deliver the Collins-class submarine life-of-type extension.

This assurance activity will not delay any of the vital work which Defence and industry are continuing to deliver to sustain and extend the life of the Collins-class fleet.

The independent assurance activity is being led by Gloria Valdez, a member of the Naval Shipbuilding Expert Advisory Panel. A classified report will be delivered to the Australian Government in the second quarter of 2024.

Incat Tasmania to deliver the World's Largest Battery-electric Ship

Incat Tasmania has under construction the largest lightweight battery-electric ship (130 m in length) so far constructed in the world for delivery to its South American customer, Buquebus.

This ship, the world's largest battery-electric ro-pax ferry, will be 100% battery electric. The energy storage system (ESS) battery at over 40 MWh will be four times larger than any battery installation that has been constructed and installed anywhere in the world for the marine transport environment. The batteries power a series of E-motors which drive the waterjet propulsion system. The electrical system integration is by Wärtsilä and the ESS by Corvus Energy.

The interest in these battery-electric ships is very positive and Incat is now working towards the construction of its second but smaller battery-electric vehicle/passenger ferry.

Incat's Founder, Robert Clifford, said "We are proud to be building in Tasmania this first-in-class ship for Buquebus who, like us, share a vision to be at the leading edge of low-emission shipping in the world. Incat has always been an innovator and, once again, we are leading the world and the world is taking notice.

This worldwide interest in Incat's capabilities to deliver electric ships is a great opportunity for Tasmania and we expect this interest to magnify.

We are already increasing our workforce and have just finalised plans for the recruitment of at least another 200

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Incat's Hull 096 under construction in Tasmania
(Photo courtesy Incat Tasmania)

employees over the next 12 months with the expectation that our workforce will more than double in coming years".

Incat's Managing Director, Craig Clifford, said "The build of the Buquebus ship is leading the world in this type of ship construction and will have leading-edge technology in terms of zero-emissions propulsion and storage systems. Once in operation, the shore-side charging systems will have 50% more capacity than any current installation world-wide.

The world-first Incat Hull 096 will have a capacity for 2100 passengers and crew, 225 cars and will also include a Duty Free Shop of over 2000 m^2 on the one level."

Craig Clifford continued: "The feedback from overseas has been extraordinarily positive. I expect that we are going to see many more battery-electric ships built here at Incat in Tasmania. The opportunities for jobs and investment here in Tasmania are exceptional.

The Australian Federal Government has a clear plan for decarbonising the economy and, with 100% renewable energy and net-zero emissions already having been achieved here in Tasmania, we are ideally placed to build zero-emission ships for the world right here.

In fact, due to Tasmania already having achieved overall net-zero emissions, we are the only location on the planet which is able to construct zero-emission battery-electric ships in an already net-zero emissions environment for our customers"

Australian Industry Learning Nuclear-powered Submarines in the UK

In early November the Deputy Prime Minister, the Hon. Richard Marles MP, joined the Rt Hon. Grant Shapps MP, UK Secretary of State for Defence, at Rolls-Royce's nuclear reactor manufacturing site in Derby where they met Australian industry personnel undertaking placement within the United Kingdom's defence industry.

The Australian industry representatives are currently undertaking three-week rotations at Rolls-Royce, BAE Systems and Babcock.

Over the nine-week program, participants will have an invaluable opportunity to learn from submarine experts across the three organisations and observe how they develop and maintain some of the most advanced submarine technologies in the world.

The placements are part of the broader efforts by Australia, with the support of the United Kingdom and the United States, to develop the workforce required to build and sustain our conventionally-armed nuclear-powered submarines and uphold the highest standards of nuclear safety and security.

Placements of Australians in the shipyards and training facilities of our AUKUS partners is essential to uplift Australia's skill base.

These placements also provide valuable insights into the skilling requirements needed across nuclear-powered submarine job functions. This undertaking will generate thousands of Australian jobs across the coming years and decades, with these placements an important first step.

Australia's conventionally-armed nuclear-powered submarine program is a whole-of-nation undertaking, creating opportunities for Australian industry nation-wide, as well as opportunities extending beyond the build of SSN-AUKUS submarines, including to support the industrial bases in the US and the UK.

AUKUS cooperation will result in benefits to industrial capability across all three nations with enhanced resilience of trilateral supply chains. There will be significant new opportunities for small, medium, and large enterprises across all AUKUS partners.

The Deputy Prime Minister also had the opportunity to tour the Rolls-Royce facility and see the first nuclear propulsion plant components being fabricated for the UK's SSN-AUKUS program.

As the UK has confirmed, Rolls-Royce will deliver complete, welded nuclear-power units for the Australian-built SSN-AUKUS submarines to be operated by the Royal Australian Navy.

Autonomous and Un-crewed Systems Tested

The Royal Australian Navy has worked with defence industry to test autonomous and uncrewed systems which have the capacity to transform the way Navy conducts maritime warfare.

Held at Jervis Bay over two weeks, Exercise Autonomous Warrior tested a range of autonomous technologies below and on the surface of the ocean.

This year's exercise focused on the development and evaluation of autonomous undersea warfare systems and related future operating concepts, critical to the Australian Defence Force's ongoing operational success.

Autonomous Warrior provides a controlled environment to continue developing trusted autonomy and to ensure that these systems complement Navy's submarine and surface fleet.

Uncrewed undersea warfare exercises such as this allow Defence to lift its capacity to rapidly translate disruptive new technology into capability, in close partnership with Australian industry, as recommended in the Defence Strategic Review.

Head Navy Capability, RADM Stephen Hughes AM CSC RAN, said that Autonomous Warrior assists with accelerating the delivery of complementary capabilities to the fleet, providing Navy with asymmetric warfighting effect options.

"Working with our allies, sovereign industry and our science and technology research partners is essential to better understand how the ADF applies uncrewed, robotic and autonomous systems in a complex, changing strategic environment," RADM Hughes said.

"This year's exercise is focused on the development and evaluation of autonomous undersea warfare systems and related future operating concepts."

During Autonomous Warrior 23, Industry and ADF members worked together operating the SR-Surveyor M1.8. This ASV allows surveyors to simplify logistics and optimize data recordings in shallow and hard-to-navigate areas
(RAN photograph)

Dongara Marine Patrol Boat Order

Dongara Marine has been awarded a multi-million dollar contract to build the WA Department of Primary Industries and Regional Development's new large patrol vessel.

Commenting on the project, Dongara Marine's Managing Director, Rohan Warr, said "The award of this project is great recognition for the work our staff, subcontractors, and suppliers have been doing building many different types of new vessels for government agencies, commercial operators, and private buyers.

An impression of the new 24 m patrol vessel to be built by Dongara Marine in WA
(Image courtesy Dongara Marine)

The new patrol vessel will carry a smaller tender on an integrated stern launch-and-recovery ramp. Dongara Marine will also build the sea boat as part of the contract
(Image courtesy Dongara Marine)

"We look forward to working with DPIRD to deliver a similarly successful shipbuilding project. In addition to a highly-capable patrol boat which will bring lasting benefits to fisheries compliance operations, that success will also be evident in employment, training, and economic benefits which will flow from its construction."

Dongara Marine expects that Western Australian industry, including many suppliers and subcontractors based in the mid-west region, will be able to contribute to the project.

"We have a highly-qualified and skilled workforce and supplier base in place, but are always on the lookout for people and businesses who can add value to our projects and operations," Rohan Warr said.

Established in Port Denison in 1975, Dongara Marine opened a purpose-built shipyard in Geraldton earlier this year. It currently employs over 60 staff. The company expects to complete a total of 11 new vessels and two major refits this year.

Award of the contract was officially announced by the Western Australian Minister for Fisheries, the Hon. Don Punch MLA, while visiting the Dongara Marine shipyard in Geraldton on 27 September.

The new patrol boat, which will primarily operate in northern waters, will be able to conduct extended voyages of up to 14 days with accommodation and food storage for 10 people,

has a more efficient hull design with twin keels to provide improved stability and reduced roll, the latest navigation equipment, and infra-red night vision to support search-and-rescue and night-time patrols.

It will also have a 5.5 m tender to conduct inspections and boarding at sea.

When completed the patrol vessel will be based in Broome and used for a range of core government roles including domestic fisheries compliance, marine park management, shark incident response, marine safety, sea search-and-rescue, whale disentanglement and illegal foreign fishing interception.

The new patrol boat is planned to be completed by September 2025.

A recent photograph showing progress on the construction of two pilot boats for Fremantle Ports by Dongara Marine (Photo courtesy Dongara Marine)

Land Agreement to build Australia's Nuclear-powered Submarines

It was announced on 10 November that the Australian and South Australian Governments have reached agreement on a land exchange for the new submarine construction yard.

The submarine construction yard, to be built at Osborne, South Australia, is a major undertaking which will employ up to 4000 workers at its peak.

Under the agreement, the appointed design and construction partner, Australian Naval Infrastructure, will progressively take ownership of key land parcels for the submarine construction yard at Osborne from December 2023.

Land will also be secured for the Skills and Training Academy that will educate and train Australia's elite submarine and naval shipbuilding workforce.

The exchange will see the Government of South Australia acquire Defence-owned land at Keswick and Smithfield, as well as part of the Cultana Training Area north of Whyalla.

The Cultana site will be used by the South Australian Government to facilitate hydrogen and renewable energy projects, while the Keswick and Smithfield sites will undergo master planning for proposed urban renewal, including increased housing supply or mixed-use development.

Work at the Osborne submarine construction yard will begin this year as the design is developed, before commencing the construction of our first SSN-AUKUS submarines in the late 2020s.

A further 4000–5500 jobs are expected to be created for the construction of the SSN-AUKUS vessels in South Australia when the program reaches its peak.

Thousands of future shipyard workers will be educated at the Skills and Training Academy across shipbuilding-related disciplines. A highlysskilled workforce is required to ensure the success of the SSN-AUKUS program and enable Osborne to continue to produce world-leading capabilities in the decades to come.

Lease-back arrangements have been put in place for the Keswick and Smithfield sites to allow Defence services and personnel to gradually relocate to alternative facilities.

Defence will maintain unrestricted access to the balance of the Cultana Training Area to enable critical ADF training exercises and operations to continue.

Austal USA Receives Order for Submarine Module Construction

In October Austal USA received its first order for components supporting construction of a US Navy Columbia-class submarine. The order, from General Dynamics Electric Boat (Electric Boat), is for fabrication of the Command and Control Systems Module (CCSM) for the third ship in the Columbia-class program (SSBN 828). Work under this order represents a significant expansion in the capabilities which Austal USA has been providing to the submarine industrial base since February 2023.

The purchase order, with a value of up to $12.8 million, was issued by prime contractor Electric Boat for work from 2024 through 2027.

The construction of this and other submarine modules is the result of the strategic partnership formed in 2022 between Austal USA and Electric Boat, supported by the US Navy, to expand the production capacity of the submarine industrial base. As part of the partnership, Austal USA is constructing and outfitting Command and Control Systems Modules (CCSM) and Electronic Deck Modules (EDM) for the Virginia- and Columbia-class programs.

Austal USA continues to expand its facilities and workforce to support the growing demand of the submarine industrial base. This project follows a recent order received from Electric Boat for three Virginia-class modules.

Austal USA Awarded Landing Craft Utility Contract

On 7 September 2023 Austal announced that Austal USA had been awarded a $US91,5 million ($A143.4 million) fixed-price incentive and firm-fixed-price type contract for the construction of three Landing Craft Utility (LCU) 1700-class craft.

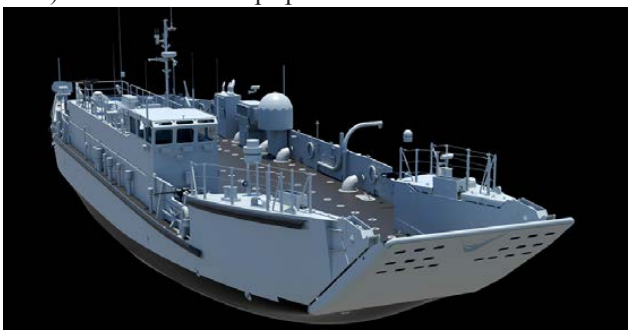
The contract follows a previous contract for the detailed design of the vessels and includes options for manufacture of an additional nine vessels and associated support arrangements.

The steel-hull LCU 1700-class possess heavy-lift capability with 170 t payload capacity, and will be deployed with the US Navy's amphibious assault ships to support a range of

military operations including the delivery of tracked and/or wheeled vehicles, troops and cargo from ship to shore, shore to shore, and back to ship.

Austal's Chief Executive Officer, Paddy Gregg, said that the new contract reinforces Austal USA's position as a critical capability partner to the United States Navy and further diversified the company's steel shipbuilding portfolio.

The LCU 1700-class has a roll-on/roll-off monohull configuration, with hydraulically-controlled bow and stern ramps which allow multiple vessels to connect and form a causeway for fast and secure unloading and loading. The craft are designed to be transported within, and load/unload from, the well decks of amphibious assault ships, carrying loads up to 3.5 m high above the vessel's vehicle deck. With a crew of 13, each vessel can conduct independent open-ocean transits or operations at sea with a range of 1200 n miles (at 8 kn) and will have a top speed of 11 kn.



The Landing Craft Utility (LCU) 1700-class to be constructed by Austal USA
(Image courtesy Austal USA)

Dorado from One2three Naval Architects

One2three Naval Architects designed the 41 m passenger ferry *Dorado* for the Water Emergency Transportation Authority (WETA) of San Francisco Bay. Built by Washinton state-based shipyard, Mavrik Marine, the vessel carries 320 passengers at 39 kn, with the additional capacity to carry 37 bicycles.

Port bow of *Dorado*
(Photo courtesy Mavrik Marine)

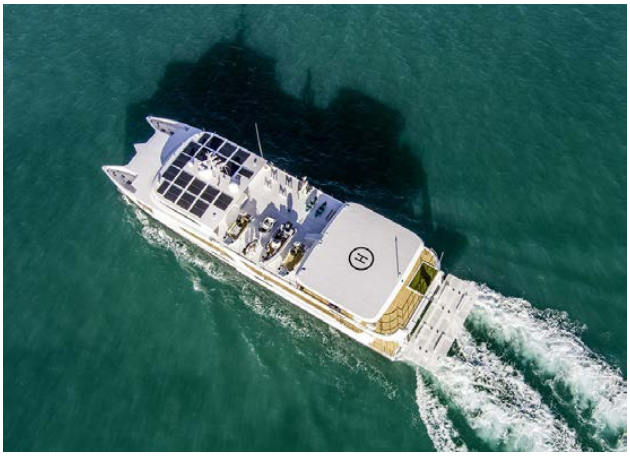
Its twin MTU diesels are fitted with the latest in emissions-reduction equipment to meet the strict California CARB emissions standards. The vessel features a rafted deck to control vibration for passenger comfort. Its efficient, low-wash hull has provided significant fuel savings compared to the existing vessels in the WETA fleet.

This is the first of a multi-boat order, with the second vessel having recently been launched in November 2023, and two further near-sister vessels to follow which will feature a lightweight quad-MAN propulsion package that will provide a further performance boost.

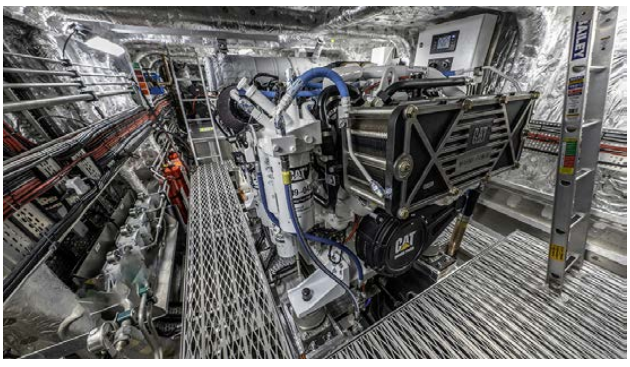
Length overall	41.9 m
Beam	10.5 m
Depth	3.47 m
Passengers	320
Fuel capacity	2×3800 L
Main engines	2×MTU 12V4000 M65R each 1920 kW at 1800 rpm
Gearboxes	2×ZF7600
Waterjets	2×Hamilton HT810
Speed	39 kn
Flag	USA
Class	DNVGL 1A HSLC Passenger R3
Survey	USCG

Charley 2 from One2three Naval Architects

The biggest launch for the year from One2three Naval Architects was the adventure support yacht MY *Charley 2*, a 56 m aluminium catamaran, built by Echo Yachts in Henderson, WA. *Charley 2* is the third motor yacht designed by One2three principals for the discerning client, following on from MY *White Rabbit Echo* (a 60 m trimaran) and the 2018 launched award-winning MY *White Rabbit Golf* (an 84 m trimaran). *Charley 2* is a standout project for One2three and Echo Yachts, and marks a significant achievement as the largest catamaran motor yacht ever built in Australia.



Bird's-eye view of *Charley 2*
(Photo courtesy Echo Yachts)



Engine room on *Charley 2*
(Photo courtesy Echo Yachts)

Charley 2 is a sister ship to an earlier MY *Charley*, a composite construction also built by Echo Yachts. Through the use of One2three's efficient hullform and an aluminium construction, *Charley 2* was able to achieve a top speed only 2 kn slower (18 kn) than its predecessor with a 40% reduction in power, all while achieving 50% more internal volume.

Efficiency extends to the yacht's electrical and air-conditioning systems, resulting in a 34% reduction in generator capacity, now at 99 ekw, along with the installation of 15 kW of solar panels to significantly reduce the vessel's carbon footprint, aligning with the owner's eco-conscious goals.

Charley 2's larger layout offers spacious interior accommodation, expansive outdoor entertaining areas, and ample water-toy storage capacity, making it a versatile addition to the owner's fleet. The vessel also has been designed to include an array of notable upgrades and features, from a 12 m custom-built catamaran tender platform to a helicopter touch-and-go pad, a dive store, decompression chamber, and specialised sonar equipment for diving adventures.

Successful sea trials were undertaken in October and the vessel has since departed for its home port of Singapore.

Port bow of *Charley 2*
(Photo courtesy Echo Yachts)

Principal particulars of *Charley 2* are

Length OA	56.30 m
Beam OA	14.80 m
Draft (maximum)	3.28 m at full load
Guest berths	18
Crew berths	19
Main engines	2×Caterpillar C32 ACERT each 1193 kW @ 2300 rpm
Gearboxes	2×ZF 3350 RR 4.721:1
Propulsion	2×fixed-pitch propellers
Speed (cruising)	12 kn
(maximum)	18 kn
Range	3800 n miles at cruising speed
Tenders and water toys	1×2 m custom catamaran tender 1×6.8 m custom Naiad RIB tender 2×Caribe C14 RIB tender 1×Williams Turbo Jet 285 2×Pioneer Multi landing craft 3×Electric jet skis
Other features	1×Launch/retrieval platform lift for 12 m tender 2×Knuckle-boom cranes for water toys 1×Decompression chamber
Construction	Marine-grade aluminium

Earth Clipper from One2three Naval Architects

One2three Naval Architects has announced the recent launch of *Earth Clipper*, the first of three new vessels for Thames Clipper, built by Wight Shipyard Co., East Cowes, Isle of Wight, UK. A pioneering hybrid high-speed passenger ferry in London, *Earth Clipper* joins a number of other One2three vessels in the Thames Clipper fleet, and recently made the first commercially-operating all-electric passage on the Thames River.

Earth Clipper has the ability to run at 28 kn on diesel, or 12 kn on electric power with zero emissions, and has the future potential to run on hydrogen. The vessel operates exclusively on battery power within Central London (in preparation for the upcoming Zero-Emission Zone within Central London) and recharges using advanced biofuel systems outside the city centre.

One2thee has contributed to Thames Clippers' mission to reduce carbon emissions by 50% in 2030, and achieving net zero by 2040 for the business overall.

Principal particulars of *Earth Clipper* are

Length OA	38.22 m
Length WL	35.05 m
Beam	8.30 m
Passengers	230
Crew	3
Speed	28 kn diesel 12 kn electric

Earth Clipper passing the London Eye
(Photo courtesy Thames Clipper)

12.6 m Littoral Manoeuvre Craft from One2three Naval Architects

As part of One2three's expanding portfolio of high-speed tactical RHIBS, the company saw MKII and MKIII of the 12.6 m NZ Navy Littoral Manoeuvre Craft (LMC) delivered. The vessels were built by Sentinel Boats in Hobart.

The vessels will service the Royal New Zealand Navy, conducting mine counter-measures, transporting divers and

troops, as well as facilitating military operations around coastal and offshore areas. The hull and targa are constructed of high-density polyethylene (HDPE) giving the boat high durability, reduced vibrations and a low acoustic signature.

The vessels can travel at up to 40+ kn thanks to twin Cummins 404 kW engines coupled with Hamilton HJX29 jets. The Hamilton jets grant impressive manoeuvrability as well as virtual anchoring and station keeping.

Principal particulars of the LMCs are

Length OA	12.60 m
Beam OA	3.69 m
Draft (maximum)	0.745 m at full load
Personnel	10
Crew	3
Main engines	2×Cummins QSB6.7L each 404 kW @ 3300 rpm
Gearboxes	2×ZF286 RR 1.237:1
Waterjets	2×Hamilton HJX29
Speed (maximum)	40+ kn
Construction	HDPE

12.6 m LMC for the RNZN at speed
(Photo courtesy Sentinel Boats)

11 m Tactical RHIB from One2three Naval Architects

As the defence industry increases its interest in autonomous technology, One2three Naval Architects has formed an important partnership with L3 Harris to convert their 11 m Tactical RHIB to an Autonomous Surface Vessel (ASV). The 11 m Tactical RHIB, built by Sentinel Boats in Hobart, provides a strong platform with twin Cummins 410 kW engines coupled with Hamilton HJX29 waterjets capable of 40+ kn. The hull is constructed of high-density polyethylene (HDPE), giving the boat high durability, reduced vibrations and a low acoustic signature.

L3 Harris has integrated their autonomous-vessel technology onto the RHIB which was on demonstration in Sydney Harbour during the Indo Pacific 2023 International Maritime Exposition. The demonstration was illustrative of the platform's capabilities, future naval tactical assault watercraft, and border-patrol operations.

Principal particulars of the Tactical RHIB are

Length OA	11.07 m
Beam OA	3.50 m
Draft (maximum)	0.827 m at full load
Personnel	10
Crew	3
Main engines	2×Cummins QSB6.7L each 404 kW @ 3300 rpm
Gearboxes	2×ZF286 RR 1.237:1
Waterjets	2×Hamilton HJX29
Speed (maximum)	40+ kn
Construction	HDPE

Rob Tulk

11 m Tactical RHIB in a turn at speed
(Photo courtesy Sentinel Boats)

NSW Al Yamama from Incat Crowther

NSW Al Yamama, the first of three new Incat Crowther 33 crew boats designed for Nakilat Svitzer Wijsmuller (NSW), has been officially launched in Singapore by shipbuilder Lita Ocean. *NSW Al Yamama*, with its homeport of Doha, and her two sister vessels, will serve as well-head maintenance vessels for QatarEnergy in the Middle East.

Designed specifically for the transfer of special maintenance personnel and equipment, the three BV-classed vessels can transport 40 people at speeds of up to 24 kn in safety and comfort. The vessel's main deck features generously-spaced passenger seating, a spacious officers' lounge with refreshment centre and two bathrooms. *NSW Al Yamama*'s large deck cargo area can hold up to 10 t of payload, ensuring that the vessel can perform the dual role of transporting personnel and crucial equipment for QatarEnergy.

Sleeping quarters for seven crew are located in the hull alongside a large lounge, mess and bathroom. The vessel's elevated wheelhouse ensures that the captain has an excellent line-of-sight for day and night operations from both forward and aft-facing helm positions.

The vessel is powered by a pair of Caterpillar C32 main propulsion engines and three Caterpillar C4.4 generator sets.

Commenting on the project, Grant Pecoraro, Managing Director of Incat Crowther USA, said that the launch of *NSW Al Yamama* by Lita Ocean was an important milestone in the project. "It's great to see the first Incat Crowther 33 now in the water, and we're confident that *NSW Al Yamama* will soon begin many years of successful service for NSW," said Mr Pecoraro.

"This project has again demonstrated the effectiveness of Incat Crowther's proven design approach, technology, and experience. *NSW Al Yamama* is the result of a true collaborative design process between our team of expert naval architects and engineers, Lita Ocean and NSW. We're now looking forward to working with Lita Ocean to launch and deliver the remainder of the new fleet," said Mr Pecoraro.

The final two vessels comprising the new crew boat build contract, *NSW Al Shuaiba* and *NSW Zikreet*, were expected to be delivered in August and September respectively.

Principal particulars of the new vessels are

Length OA	33.0 m
Length WL	32.0 m
Beam OA	7.00 m
Depth	3.50 m
Draft (hull)	1.63 m
Passengers	40
Crew	7
Fuel oil	34 000 L
Fresh water	20 000 L
Black Water	1 000 L
Main engines	2×CAT C32 ACERT each 1081 kW @ 2000–2300 rpm
Propulsion	2×propellers
Generators	3×CAT C4.4
Speed (service)	20 kn
(maximum)	24 kn
Construction	Marine-grade aluminium
Flag	Qatar
Class/Survey	Bureau Veritas

Starboard bow of *NSW Al Yamama*
(Photo courtesy Incat Crowther)

Port quarter of *NSW Al Yamama*
(Photo courtesy Incat Crowther)

Customs Boat 523 from Incat Crowther

Incat Crowther has announced the delivery of a new high-performance, state-of-the-art 20 m patrol vessel to Thailand's Customs Department. Unveiled at a launching ceremony attended by dignitaries and senior leaders from the Customs Department in April, the 20 m monohull patrol vessel, *Customs Boat 523*, is now patrolling the oceans off the coast of Thailand.

Delivered in partnership with Thai shipbuilder, Seacrest Marine, *Customs Boat 523* can operate at speeds of up to 35 kn with a cruising range of up to 300 n miles. The delivery to Thailand's Customs Department is the latest successful collaboration between Seacrest Marine and Incat Crowther, with the duo successfully delivering six vessels for government departments in Thailand including both the Customs Department and the Thai Police Department.

Port bow of *Customs Boat 523* on trials
(Photo courtesy Incat Crowther)

Designed for maximum performance and efficiency, *Customs Boat 523* boasts an efficient hull paired with twin-propeller propulsion. The design of the vessel has also been tailored to the Customs Department's operations with a low draft allowing for operation in shallow coastal waters. The large wheelhouse on the main deck provides optimal sightlines for the crew, while the vessel also has high-powered search, side, and flood lights to allow for operations in darkness. The vessel's deck provides space for a large galley and comfortable sleeping quarters for three crew on rotation.

Tanapat Hemangkorn, Managing Director of Seacrest Marine, said the delivery of *Customs Boat 523* was the result of a successful collaborative process between Incat Crowther and Seacrest Marine. "We have worked closely with Incat Crowther over several years now to deliver vessels to multiple Thai Government agencies. In the case of *Customs Boat 523*, Incat Crowther provided a proven monohull platform which would meet the department's performance requirements," said Mr Hemangkorn. "The final product is a vessel which is truly tailored to the operational requirements of Thailand's Customs Department, and we are incredibly pleased to have delivered another state-of-the-art vessel in partnership with Incat Crowther."

Principal particulars of *Customs Boat 523* are

Length OA	20.50 m
Length WL	20.14 m
Beam OA	5.50 m
Depth	3.10 m
Draft (hull)	0.85 m
Crew	6
Fuel oil	2400 L (service)

	2280 L (wing tanks)
Fresh water	479 L
Sullage	365 L
Main engines	2×MTU 10V2000 M96L each 1193 kW @ 2450 rpm
Propulsion	2×propellors
Speed (service)	20 kn
(maximum)	37 kn
Construction	Marine-grade aluminium
Flag	Thailand
Class/Survey	NSCV Fast Craft (Fire and Safety) Lloyd's Register SSC Patrol G3 (Structure)

56 m Ro-pax Ferries from Incat Crowther

The Abu Dhabi Ports Group has commissioned Penguin Shipyard International, a wholly-owned subsidiary of Singapore-based Penguin International Limited, and Incat Crowther to design and deliver two new 56 m ro-pax catamaran passenger and vehicle ferries. The new vessels will be built by Penguin International in Indonesia and are capable of transporting up to 194 passengers and 25 vehicles.

Replacing two older vessels in the Abu Dhabi Ports Group fleet, the new vessels will service Delma Island from Jebel Dhanna on the UAE mainland, a 42 km route. Powered by four MTU Engines and Kamewa 71 S-4 waterjets, the new vessels are designed specifically for local environmental conditions. Capable of travelling at a service speed of 35 kn, the vessels are designed to deliver a seamless, safe and convenient customer experience.

The vessels' air-conditioned passenger deck boasts spacious seating on a single passenger deck and provides space for eight wheelchair passengers, while two large viewing areas are located at the bow and stern. A VIP room for eight passengers, two cafés, five bathrooms, and a children's playroom are also located on the passenger deck to ensure that the vessels service the needs of every passenger. Ample luggage and cargo spaces have also been included throughout both the passenger and vehicle decks.

The vehicle deck has been designed for operational efficiency and will allow for quick roll-on and roll-off operations. The elevated wheelhouse provides the ship's captain with excellent lines of sight, while the bridge deck also features a crew mess and toilet for each vessel's 10 crew.

Starboard bow of 56 m ferries for Abu Dhabi Ports Group (Image courtesy Incat Crowther)

Commenting on the project, Incat Crowther's Managing Director Europe, Ed Dudson, said "This exciting project will see Incat Crowther's team of digital shipbuilders and naval architects working closely with Penguin Shipyard International and Abu Dhabi Ports Group to deliver two state-of-the-art tailored passenger vehicle ferries. Incat Crowther's experience in delivering tailored, efficient and customer-focused ro-pax ferries to operators around the world meant that we were well placed to deliver on Abu Dhabi Ports Group's brief to deliver two high-quality operationally-efficient ferries".

"The two vessels are now under construction in Penguin's Batam, Indonesia, shipyard and we're looking forward to trials taking place next year," said Mr Dudson.

Principal particulars of the 56 m ferries are

Length OA	56.0 m
Length WL	54.2 m
Beam OA	14.5 m
Depth	2.75 m
Draft (hull)	1.90 m
Passengers	194 including 8 wheelchairs
Vehicles	25 cars/4 vans and 15 cars
Crew	10
Fuel oil	7000 L day tanks 26 000 L long range
Fresh water	5000 L
Black water	3000 L
Main engines	4×MTU 16V4000M65L each 2560 kW @ 1800 rpm
Propulsion	4×KAMEWA S71-4 waterjets
Generators	4×75 kVA
Speed (service)	35 kn
(maximum)	38 kn
Construction	Marine-grade aluminium
Flag	UAE
Class/Survey	TASNEEF

Three 60 m Fast Support Intervention Vessels from Incat Crowther

Incat Crowther has been commissioned by Singaporean shipbuilder Lita Ocean to design three new ABS-classed monohull fast support intervention vessels (FSIVs) for Zamil Offshore. The new 60 m FSIVs will assist Zamil Offshore with the efficient and safe transport of cargo, heavy maintenance equipment and personnel for Saudi Aramco's operations in the Middle East. The vessels will comply with the latest MCVSR requirements from Saudi Aramco, including ABS SMART and IDM-A notations.

The new vessels will be powered by four MTU 16V4000 diesel engines coupled to ZF gearboxes driving Hamilton HT810 waterjets, providing a full-load service speed of 25 kn. Manoeuvrability of the DP2-certified vessels is enhanced by three Hydromaster bow thrusters, allowing safe docking and unloading of cargo and personnel. Two of the main engines will be coupled to 1200 m^3/h firefighting pumps offering FiFi-1 capability.

The vessel's main deck offers an expansive 250 m^2 aft cargo deck rated at 2.5 t/m^2 and a climate-controlled forward cabin featuring business-class seating for 60 service personnel in a spacious passenger lounge, as well as three bathrooms,

an office, snack bar and well-equipped medical bay. The vessel's 18 crew are housed on the main deck which offers four two-berth cabins, two four-bed dorms and two single-bed dorms. The main deck also features a large pantry, mess, three bathrooms and laundry. The health of the crew is also prioritised with an isolation room located behind a sealed door.

Three 60 m FSIVs for Zamil Offshore
(Image courtesy Incat Crowther)

Commenting on the project, Incat Crowther's US Managing Director, Grant Pecoraro, said "By working closely with our valued partners at Lita Ocean, these vessels will provide Zamil Offshore with state-of-the-art, low-draft FSIVs which are truly tailored to their operational requirements. The design of these vessels offers an excellent combination of operational efficiency, seakeeping capability, manoeuvrability, and stability".

Yeo Yingda of Lita Ocean said "Incat Crowther was the natural partner for the design and development of the new FSIVs. Lita Ocean has enjoyed partnering with Incat Crowther to deliver truly tailored and operationally-efficient vessels to operators throughout Asia and the Middle East. We are pleased to tap into Incat Crowther's vast experience with large FSIVs".

Testing of the first vessel is expected to take place in 2024, with the final vessel to be delivered in 2025.

Principal particulars of the three new FSIVs are

Length OA	59.8 m
Length WL	56.1 m
Beam OA	9.00 m
Depth	4.45 m
Draft	2.15 m
Gross tonnage	498
Industrial personnel	60
Crew	18
Fuel oil	135 000 L
Fresh water	20 000 L
Grey water	1800 L
Black water	1800 L
Lube oil	2000 L
Waste oil	2000 L
Bilge oil	2000 L
Main engines	4×MTU 16V4000M63L each 2240 kW @ 1800 rpm
Propulsion	4×Hamilton HT810 waterjets
Bow thrusters	3×Hydromaster 150 kW
Speed (service)	25 kn
(maximum)	36 kn
Construction	Marine-grade aluminium
Flag	Bahrain
Class/Survey	✠A1, Circle E, HSC Crewboat, ✠AMS, ✠DPS-2, FF Capable, SMART (INF, SHM, MHM), IDM-A

Island Guardian from Incat Crowther

Incat Crowther has announced the delivery of *Island Guardian*, a new high-speed low-draft landing craft, to the Great Barrier Reef Joint Field Management Program. The new custom-designed 21 m vessel will enhance island protected area management, research and incident response, and facilitate more-efficient management of the Great Barrier Reef World Heritage Area.

The Great Barrier Reef Joint Field Management Program is delivered jointly by the Great Barrier Reef Marine Park Authority and the Queensland Parks and Wildlife Service, part of the Department of Environment and Science. Constructed by Norman R. Wright & Sons in Queensland, *Island Guardian* is the fourth Incat Crowther-designed vessel delivered to the program.

Island Guardian has been designed specifically to allow the transportation of equipment and vehicles to remote areas of the reef. The vessel can carry up to 7.5 t of deck cargo, including vehicles such as four-wheel drives, trailers, excavators, compact track loaders or small tractors.

Cargo loading is facilitated by an Incat Crowther custom-designed bi-folding vehicle ramp on the bow. In conjunction with a low draft of only 1.07 m and a reinforced forefoot, the vessel can safely land on a large range of gradients, including beaches or boat ramps. A deck crane has also been fitted with the ability to lift a payload of 680 kg at a 7.5 m radius.

Island Guardian on trials
(Photo courtesy Incat Crowther)

The robust engineering of the bow ramp also gives *Island Guardian* the capability to safely rescue and release marine life weighing up to 600 kg.

The vessel has a very economical cruising speed of 20 kn and the capability to travel at a maximum speed of 25 kn. The hull has been designed to incorporate the bow ramp while not limiting the ability to combat rough seas from south-east trade winds. Propeller tunnels facilitate the use of efficient propulsion whilst maintaining low draft for beach landings.

Island Guardian can transport up to 24 personnel in addition to the cargo. The main deck has a galley, crew lounge, crew mess, and bathroom. Twin crew berths are located on the main deck, port hull and starboard hull. Additional seating for service personnel is located on the working deck via folding seats. Multiple deck lockers add to the vessel's functionality.

The wheelhouse features a full walk-around and has been designed to ensure excellent visibility of the working deck and bow ramp from both its central helm position and exterior wing stations. The wheelhouse features a single master's berth, ample storage and crew seating. The exterior of the wheelhouse deck features the vessel's rescue boat, additional freezer space, a laundry and a bathroom.

Incat Crowther's Technical Manager, Dan Mace, said "The brief we received from the Great Barrier Reef Joint Field Management Program was a complex, yet exciting one. The challenge was to deliver a vessel with several unique elements to enable it to operate safely and efficiently in one of the most pristine environments in the world," said Mr Mace. "Our goal was to design a low-draft vessel which could deliver valuable cargo on high-speed transits in rough seas, land on a range of beaches and boat ramps, and support rescue-and-recovery missions, all whilst minimising impact on the environment. Our team collaborated closely with the client to achieve this, and we are pleased that the customer is incredibly happy with the final product."

Tony Riek of Norman R. Wright & Sons said "*Island Guardian* performed flawlessly on sea trials. The successful build involved use of our lightweight construction techniques and high standard of build quality. The package delivered by Incat Crowther streamlined the physical shipbuilding process and delivered on a very complex set of parameters. We are very pleased to achieve such a successful outcome for the client."

Galley on *Island Guardian*
(Photo courtesy Incat Crowther)

Dining tables on *Island Guardian*
(Photo courtesy Incat Crowther)

Wheelhouse on *Island Guardian*
(Photo courtesy Incat Crowther)

To see a video of *Island Guardian* in action, visit https://youtu.be/l0KaPLdCwPs

Principal particulars of *Island Guardian* are

Length OA	21.25 m
Length WL	20.90 m
Beam OA	7.50 m
Draft (hull)	1.07 m
Depth	2.50 m
Passengers	12 (1C)/0 (2B)
Crew	12 (1C)/14 (2B)
Fuel oil	8480 L
Fresh water	1000 l
Sullage	400 L
Main engines	2×MAN D2868 LE426 V8-1000 each 735 kW @ 2300 rpm
Propulsion	2×fixed-pitch propellers
Generators	2×CAT C4.4
Speed (service)	20 kn
(maximum)	25 kn
Construction	Marine-grade aluminium
Flag	Australia
Class/Survey	USL Code/NSCV Class 2B/1C

Stewart Marler

Cruising in NSW

The winter quiet saw *Carnival Splendor* and *Pacific Adventure* working out of Sydney, the decreased number from six vessels pre-pandemic being indicative of the reduced demand for winter cruises.

The arrival of *Celebrity Solstice* on 19 October signalled the start of the next summer season. She was quickly followed by *Grand Princess, Brilliance of the seas, Royal Princess, Coral Princess* and *Disney Wonder.*

November moved into a higher gear, with return visits by these vessels plus *Ovation of the Seas, Majestic Princess,* and *Noordam.* Vessels berthing regularly at the Overseas Passenger Terminal at Circular Quay is a sure sign that the summer cruise season is under way.

Cruise vessels continue to call at Eden, with 33 visits scheduled over the coming season and *Brilliance of the Seas* opening the berthing on 23 October, followed by *Majestic Princess, Brilliance of the Seas* (again), and *Pacific Adventure* up to mid-November.

Phil Helmore

Brilliance of the Seas berthed at the Eden cruise-ship wharf on 23 October
with the new wave attenuator centre right
(Photo courtesy Robert Whiter)

Ovation of the Seas departing Sydney on the evening of 3 November
(Photo John Jeremy)

AIMS Research Vessel Replacement Program

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1. Introduction

The Australian Institute of Marine Science (AIMS) is a Commonwealth marine-science research organisation which supports the sustainable use and protection of Australia's tropical marine ecosystems. AIMS is a world leader in tropical marine research, providing a unique insight into Australia's tropical waters, and knowledge to develop globally-relevant and innovative research solutions to improve ocean health, and protecting coral reefs from climate change.

AIMS' strategy is to deliver the science to help realise three key long-term impacts for Australia: improving the health and resilience of marine and coastal ecosystems across northern Australia; creating economic, social, and environmental net benefits for marine industries and coastal communities; and protecting coral reefs and other marine ecosystems from the effects of climate change [1].

AIMS conducts research from Shark Bay in Western Australia, across the northern coast and its marginal seas, and to the southern extremity of the Great Barrier Reef on the East coast (Figure 1). AIMS' world-class research infrastructure includes two purpose-built coastal research vessels, and the Sea Simulator National Facility, the world's most advanced research aquarium complex.

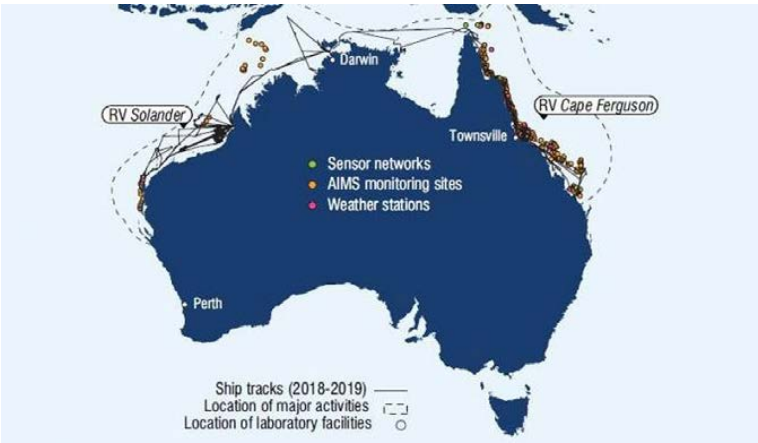

Figure 1: AIMS research area
(Chart courtesy AIMS)

The AIMS Research Vessel (RV) fleet consists of two large ships, RV *Cape Ferguson* and RV *Solander*, and a number of smaller vessels which take researchers to the diverse habitats of Australia's northern coasts. Both large vessels are approaching end-of-life, and replacement vessels need to meet the current and future needs of AIMS and its stakeholders.

This paper presents the challenges and opportunities in delivering the next AIMS research vessel and its supporting infrastructure. The paper discusses the development of requirements, the procurement process, the design process, construction limitations, the development of the supply chain, stakeholder engagement, environmental and social impacts, and the expected benefits of the new vessel.

2. AIMS Current Research Vessels

2.1 History of AIMS' Research Vessel Fleet

AIMS has operated RVs since the 1970s. The current fleet, consisting of 24 m *Cape Ferguson* (built 2000) and 35 m *Solander* (built 2007), are monohull vessels based on traditional designs with scientific capability integrated once the arrangements had been developed, compromising scientific functionality to fit within a preconceived vessel design. Vessel size has been dictated by operating costs and capital budgets.

Cape Ferguson and *Solander* are equipped with a range of scientific capabilities and equipment to support AIMS field-based research priorities and activities, including coral reef monitoring, seabed mapping, marine biodiversity surveys, reef restoration and oceanography. AIMS vessels are home ported in Townsville and visit ports at Gladstone, Cairns, Cooktown, Darwin, Broome, and Exmouth, while also periodically visiting wharf facilities at small coastal communities.

The vessels are specially equipped with on-board laboratories, flow-through aquaria, computing facilities, and machinery to support equipment deployment and recovery including A-frames, scientific winches, and heavy lifting winches. These capabilities allow scientists to sample the physical and biological characteristics of various habitats and conduct experiments at sea. Inflatable tenders and on-board compressors support diving operations from the major vessels [2].

Cape Ferguson (Figure 2) is now 23 years old with a scheduled possible replacement in 2028. *Cape Ferguson* is a smaller vessel primarily used for voyages on the east coast along the Great Barrier Reef.

Figure 2: RV *Cape Ferguson*
(Photo courtesy Jo Gioffre, AIMS)

Figure 3: RV *Solander*
(Photo courtesy Jo Gioffre, AIMS)

Solander (Figure 3) is now 16 years old with a scheduled possible replacement in 2032. *Solander* is both larger and more capable than *Cape Ferguson* and is utilised on voyages from locations at Ningaloo Reef in Western Australia, across the Top End, and down to the southern Great Barrier Reef.

2.2 Need for a New RV in Northern Australia

AIMS requires a new RV to provide capability to conduct future marine science and to replace the current vessels coming to the end of their in-service phase. RV *Cape Ferguson's* in-service support costs are increasing due to vessel age, structural degradation and as systems become unsupportable.

Capabilities and facilities, such as range, science sensors, information technology and communications, laboratories, working deck area, facility for modular—and autonomous systems—and launch-and-recovery systems require update to facilitate AIMS future science operations safely and efficiently.

AIMS is also seeking to show leadership in the sustainability of its research operations, and it is imperative that a new research vessel delivers an improvement in operational efficiency, achieving a significantly reduced environmental and carbon footprint.

3. Program Overview

3.1. Scope

The objective of the project is to deliver the next generation of regional class research vessel and support infrastructure. An environmentally-friendly future-proofed marine-science platform, capable of supporting work in the tropical environment of northern Australia for the next 30 years, supported with modular capability to provide flexibility and future proofing [3]. The project involves the delivery of two separate integrated systems: the vessel and the modular capability.

3.2. Business Case to Government

As vessel, modular capability and support-system designs mature, AIMS will work to obtain Government approvals to authorise production. Activities include developing cost models for construction and life of asset, risk plans and construction schedules, and packaging these inputs into a Business Case to Government.

This process provides an opportunity for AIMS to validate the budget by testing the production budget in the market before defining it in the Business Case.

3.3. Issues Important to AIMS

AIMS intends to deliver the project with a focus on industry-leading work health and safety outcomes, on environmental sustainability design outcomes, on reducing whole-of-life costs in the operation and sustainment of the developed systems, and with a strong Australian industry content position.

3.4. Program Schedule

A high-level indicative schedule for the Research Vessel Replacement Program is included below and shows the key milestones for the program (Table 1 and Figure 4).

Table 1: Key near-term milestones

Milestone	Date
Preliminary Design Review	31 October 2023
Expression of Interest for Containerised Modular Capabilities Submission	**17 November 2023**
Expression of Interest for Vessel Construction Submission	**1 December 2023**
Business Case Preparation	15 December 2023
Positive Ship-build Budget Announcement (pending Government approval)	7 May 2024
Request for Tender for Vessel Construction	1 July 2024

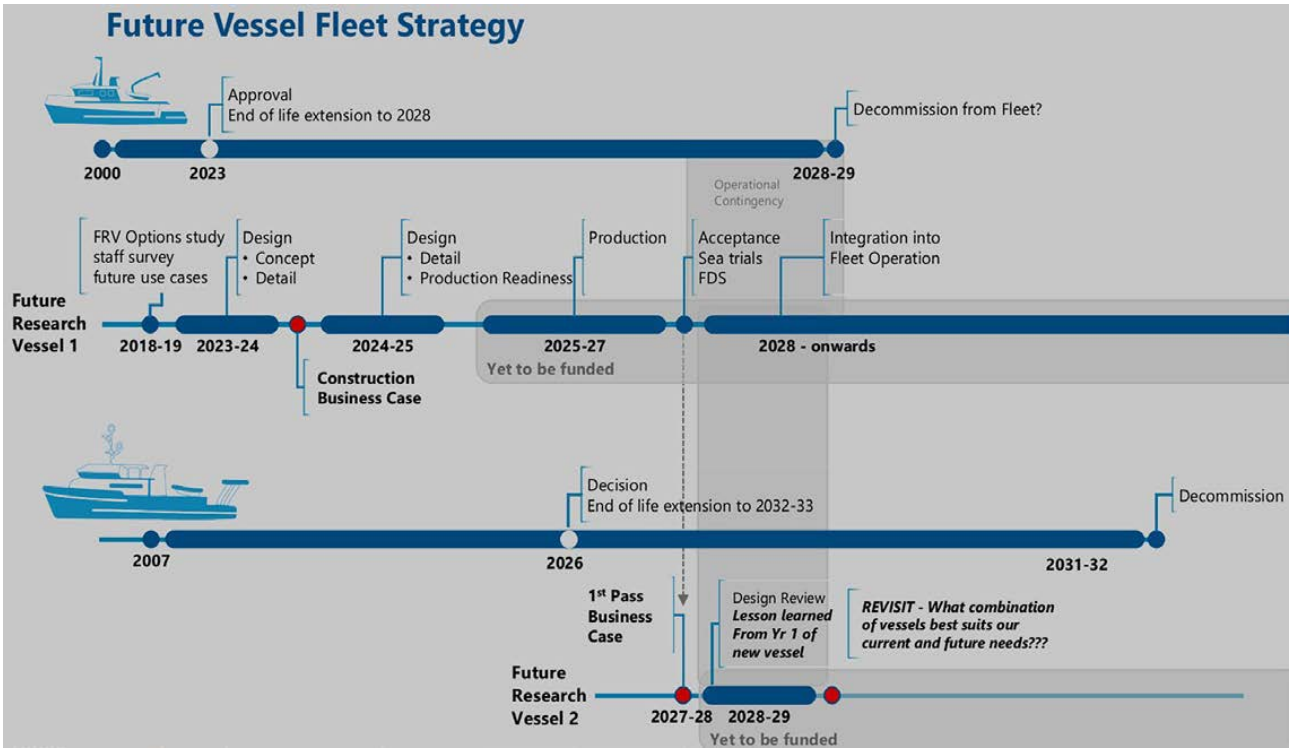

Figure 4: Program Strategy
(top vessel is *Cape Ferguson*; bottom vessel is *Solander*)
(Diagram courtesy AIMS)

3.5. Procurement Process

To support the procurement process and the development of the Business Case, AIMS has invited prospective shipyards and containerised capability manufacturers to submit Expressions of Interest (EoI), via AusTender, based on preliminary design data. Data from these processes will be used to inform the Business Case to Government and to down-select potential production contractors for the Request for Tender (RFT) stage. The RFT will be published on AusTender after an authorisation to proceed from Government, and will be based on Detailed Design data. Data from the RFT process will inform selection of production contractors.

4. Stakeholder Engagement

Stakeholder engagement is critical to project success, and key stakeholders have different roles to play on the program including governance, requirements development, design review, technical and program advice, and design, construction, and certification expertise. Working group meetings are held throughout the project to relay data to stakeholders and allow for AIMS experts to provide data inputs on design, production, project management, legal, certification, HSE and risk to assist the Project Governance make informed decisions.

The external project advisory group consists of members of the Australian and international research vessel operator community to provide an external and independent view of the project, with focus on lessons learnt from other research vessel builds, modular capabilities, data management and scientific capability. Gibbs & Cox Australia has been contracted to provide project-management services and provide specialised engineering, construction, project management, in-service support, certification, and procurement advice.

5. Requirements Development

5.1. Stakeholder Design Input

The project planning and development of the large vessel specification has occurred since 2018 and involved the gathering of data from stakeholders including operational data from the current fleet, future-use case surveys of vessel users, operators, and technology development, conducting design studies and engaging with the research vessel operator community. This foundation work led to the development of use cases in 2022.

5.2. Vessel Use Cases

Use cases define voyage length and crew, scientist, and technical-support personnel. These metrics drive the vessel capabilities and facilities required to complete voyages in terms of accommodation, vessel systems and supporting infrastructure.

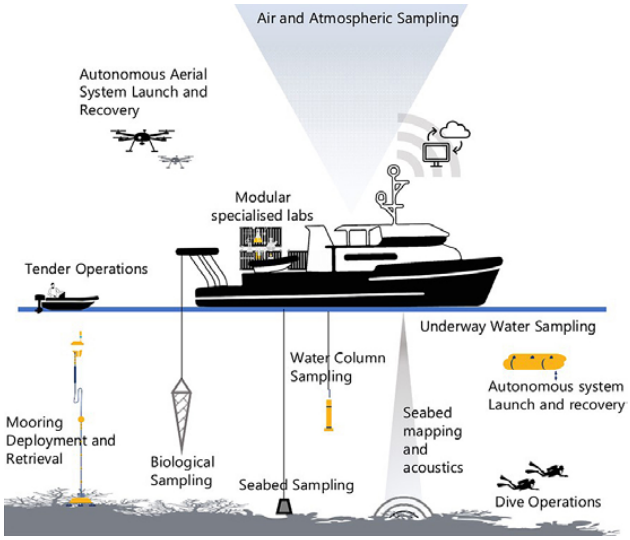

Figure 5: Vessel operating model
(Diagram courtesy AIMS)

5.3. Design Brief

The Design Brief was developed by considering the use cases and capability requirements, and nominates a vessel size, including length, beam and draft to meet use case requirements while providing for growth and future capability. It defines the area of operation including vessel research sites and port facilities. It lists required vessel systems and capabilities at a high level and is the specification used in the Vessel Design contract. A separate Design Brief has been developed for the Modular Capabilities.

5.4. Functional Performance Specification

The vessel Functional Performance Specification (FPS) has been developed in conjunction with the Vessel Designers by refining the Design Brief into single requirements and assigning them to system and subsystem groups. This allows like requirements to be sorted, filtered, and assigned to certain design groups within the Vessel Designers organisations. It also enables requirements to be validated during the Preliminary Design phases by confirming that they are achievable and will result in a design which will meet the intent of the Design Brief.

5.5. Technical Specification

The Technical Specification has been developed by the Vessel Designers to describe the systems and subsystems which will meet the requirements of the FPS. The Technical Specification allows traceability to the FPS and will be provided to shipyards during the RFT process to enable detailed costing and scheduling.

5.6. Regulatory and Compliance Requirements

The vessel will be built under survey to AMSA (NSCV) and Class (DNV) so that it can operate as a Domestic Commercial Vessel (DCV) and, for select voyages, as a Registered Australian Vessel (RAV).

5.7. Primary Design Requirements

AIMS' primary design requirements for the new research vessel are summarised in Table 2.

Table 2: AIMS' Design Requirements

Section	Subsection	Requirement for new design
Class	IACS	Vessel to be built and maintained in Class
Flag	AMSA	NSCV 2B Extended—designed RAV but operation as DCV
Principal Dimensions	Length Overall	35–45 m
	Beam	16 m maximum
	Draught	3.0 m maximum
	Gross Tonnage	<500 GT
	Scientist capacity	18 specialised personnel
	Crew	8 vessel crew
	Speed	6–10 kn and transit capability 12–14 kn
Range	Range/Endurance	21 days, 3000 n miles
Science Spaces and Equipment	Dry Lab	Maximise as general configurable space
	Wet Lab	12 m^2
	Aft working deck	Large open work deck 100+ m^2
	Deck Crane	8 t lift capacity at side of vessel
	A-frame (stern)	10 t lift
	Hydrographic frame	Starboard side for sampling/CTD
Arrangement	Crew accommodation	Single berths located away from scientists
	Scientist accommodation	Double berths
Operability	Seakeeping	Optimise for working conditions up to 2.5 m significant wave height
	Steering and Manoeuvrability	Position holding capability and good manoeuvrability

6. Design Process

6.1. Design Study

In 2019 AIMS tasked Knud E. Hansen to conduct a design study into options for a littoral research vessel, and a paper on this work was presented at the Pacific International Maritime Conference in 2019 [4]. The study focus was to "improve both the capability of the future vessel while also reducing the vessel's operational costs and improving its 'green' profile". The study discussed various hullforms, concluding that either a monohull or trimaran best met AIMS' requirements. It also discussed green technologies which could be applied to the future vessel to improve sustainability outcomes, including alternative fuels, shaft generators, batteries, solar, wind power, and variable-frequency drives. The study provided engineering and design data to help validate the use case and capability requirements, and assisted in the development of the Design Brief.

6.2. Choosing a Designer

In 2022, AIMS approached the market to identify Vessel Designers to take the Design Brief forward through concept, preliminary and detailed design. The process resulted in Glosten, One2three Naval Architects, and Maritime Survey Australia (MSA) being chosen as the Vessel Design team. Glosten is an experienced research-vessel designer based in Seattle USA, One2three are experts in multihull vessels based in Sydney, and MSA—based in Melbourne—ensure that the vessel's design will meet Australian survey and class requirements.

6.3. Concept Design & Selection

The Vessel Design team was first tasked with presenting three concept designs for AIMS selection. Prior to commencement of Concept Design, AIMS settled on three platform concepts:

- Monohull: the traditional approach reflecting current industry choices for offshore research vessels.
- Catamaran: an alternative approach which offers compelling advantages for further investigation.
- Trimaran: potentially blending advantages of the monohull and catamaran into a single platform.

6.3.1. Drivers in the Design

Early in the Concept Design phase, several key design drivers were identified as crucial to design development:

Gross Tonnage Limit

To avoid additional crewing requirements when operating as an RAV, the design was limited to a maximum of 500 GT. This tonnage cap constrained the design space, limiting the vessel's overall dimensions and extent of enclosed accommodation. All three platform concepts were restricted by the tonnage limit.

Draft

To facilitate ready access inside the reef system, the design was limited to a maximum fully-loaded draft of 3 m. For the monohull, the combination of the tonnage limit and the maximum draft limit made it impracticable to build a steel vessel which was changed to an aluminium design.

Deck Area

The new vessel is required to support deployable modular capability, enabling the vessel to be reconfigured with multiple mission-specific ISO containers prepared ahead of time. The modular capability requirement, without compromising stern and side overboard operations or autonomous surface-vessel operations, requires the design to cater for maximum aft deck working space.

6.3.2. Design Process

The design team developed three concept designs; each design compliant with AIMS' stated requirements.

Table 3: Concept design principal dimensions

	Monohull	Catamaran	Trimaran
Length overall (m)	37.7	41.7	42.9
Beam overall (m)	10.4	13.0	14.2
Displacement (t)	611	328	339
Draft (m)	3.0	3.0	2.9
Gross tonnage	490	489	499
Aft deck area (m^2)	112	179	158

The notable differences between the three designs are discussed below.

Seakeeping

ShipMo3D was utilised to evaluate the seakeeping response of the three variants and the existing *Solander* vessel at various locations within the craft, including aft working deck and science labs. The results were mixed, and dependent on the wave conditions, in particular the wave period. In longer waves (reflective of west-coast Australia deeper waters) the catamaran exhibits the best overall performance. At very short periods (reflective of east-coast Australia operations in shallow waters), the monohull performs well and is less likely to suffer from the roll resonance observed with both multihulls.

In general, the multihulls provide lower amplitudes of motion but a stiffer response with higher acceleration levels, particularly at beam extents. Conversely, monohull motions tend to be smoother and easier to anticipate, but with higher amplitudes of motion.

Figure 6: Rendering of monohull concept design
(Image courtesy AIMS)

Figure 7: Rendering of catamaran concept design
(Image courtesy AIMS)

Figure 8: Rendering of trimaran concept design
(Image courtesy AIMS)

Machinery Selection

The monohull, with its full-breadth machinery space and higher buoyancy, can accommodate heavier azimuthing L-drive thrusters which, in turn, can be driven electrically. Three main identical generators power the ship, providing both hotel and propulsion power centralised in a single space. A small auxiliary genset is located separately for emergency power. The azimuthing thrusters provide significant advantages in terms of manoeuvring and station-keeping capabilities with the ability to 'crab' if desired for science operations.

The catamaran design, with inherently less buoyancy, utilises a conventional propulsion drive-train and power-generating setup, comprising two diesel main engines driving fixed-pitch propellers via reversing reduction gearboxes. Redundancy is provided by locating one main drive train and one genset in each hull. Manoeuvrability in terms of main propulsion is good due to the widely-spaced separation of the drive trains. Station keeping is limited by bow thruster capability and, despite a bow thruster in each demihull, the second thruster can only achieve approximately 20% thrust effectiveness due to reflection of the thrust by the other hull.

The trimaran, also being limited by available buoyancy, has the same conventional power train as the catamaran but with both main engines located in the centre hull in the same compartment. Redundancy is partially reduced with this configuration, as is manoeuvrability, due to the narrow separation between drive trains (least separation of all three variants). Compared to the catamaran, the bow thrusters are more effective on the trimaran with no hull interaction limiting thrust.

Working Decks

All three designs accommodate the modular capability requirements, with a minimum of two standard 20 ft containers fitted to the aft deck. The multihulls, with their increased beam, allow for a more flexible arrangement, future expansion and provide increased ability to offload containers with reduced angles of heel. The trimaran design has the widest aft working deck which allows the greatest flexibility, including the potential addition of a third container while maintaining access to the aft A-frame and aft boarding platforms.

Both multihulls provide large external upper deck for crew recreation and for storage of tenders. The catamaran has the unique advantage of a large foredeck area which could be used for launch and retrieval of unmanned aerial or surface vehicles (drones).

Habitability

Safety is a key concern for AIMS with on-board stairways a natural area for potential risk during scientific operations at sea. Due to the available beam, the multihulls have one less deck than the monohull. This configuration also supports all scientist's working and accommodation spaces to be on a single deck, eliminating stairs for scientists during their normal operational day.

The superstructure spaces above the main deck are not included in the multihull stability reserves. Therefore, these spaces can offer superior habitability in the form of large apartment-styled windows in scientist's cabins and the wet and dry labs. The increased vessel beam allows increased opportunity to offer large mess spaces, doubling as meeting areas for the full vessel complement.

6.3.3. Concept Selection

Each platform variant offers primary and secondary advantages. The design team summarised these advantages using a non-weighted approach listing the advantageous aspects and rating each design for extent of compliance. Each advantage is wholly assessed within the context of the AIMs specific requirements.

Table 4: Relative ratings for each variant

Section	Monohull	Catamaran	Trimaran
Science Capability			
Low freeboard to working deck	✓✓✓	✓	✓✓
Stern A-frame operations	✓✓✓	✓	✓✓
Side a-frame operations	✓✓	✓✓✓	✓✓
Size aft working deck	✓	✓✓✓	✓✓✓
Unobstructed side working deck	✓✓✓	✓	✓✓
Working lab size	✓✓✓	✓✓	✓✓
Lab connectivity to working deck	✓	✓✓	✓✓✓
Tender and ASV LARS capability	✓	✓✓	✓✓✓
Emission-free science ‘side’	✓✓✓	✓	✓✓
Integration of underway science systems	✓✓✓	✓	✓✓
Human Factors			
Single deck scientists’ accommodation	✓	✓✓✓	✓✓✓
Scientist habitability	✓✓	✓✓✓	✓✓✓
Vessel Performance			
Seakeeping	✓✓	✓✓✓	✓✓
DP station-keeping capability	✓✓✓	✓	✓
Transit speed	✓	✓✓✓	✓✓
Fuel efficiency	✓	✓✓	✓✓✓
Stability margins	✓	✓✓✓	✓✓
Crane/container over the side capacity	✓	✓✓✓	✓✓
Alignment with AIMS branding and values	✓✓	✓	✓✓✓
Above deck stores capability	✓	✓✓✓	✓✓✓
Tankage capability	✓✓✓	✓	✓✓
Clear open foredeck	✓	✓✓✓	✓
Machinery			
Engine room maintenance space	✓✓✓	✓	✓✓
House load power generation redundancy	✓✓✓	✓✓	✓✓
Ability to accommodate green initiatives	✓✓	✓✓	✓✓
Costs			
Shipyard pool w/ experience	✓✓✓	✓✓	✓
Local shipyard experience with platform	✓✓	✓✓✓	✓✓
Ease of build / low cost	✓✓✓	✓✓	✓
Lifecycle costs	✓✓	✓✓	✓✓✓

The concept design package, presented to AIMS in April 2023, included general arrangements, main equipment definitions and seakeeping analyses. Each concept’s expected performance was compared to that of RV *Solander*. Concept Design evaluation criteria included:

- ship particulars;
- health, safety and environment;
- deck space and operational flexibility;
- AIMS image and reputation;
- arrangement and interaction of science spaces;
- seakeeping and stability performance;
- lifecycle costs;
- modular capability considerations;
- environmental and sustainability approach; and
- margin allowances.

A weighted scoring evaluation was conducted with participants covering the project team, science user groups, external consultants, operations, and vessel sustainment. All concepts scored higher than the existing AIMS monohull capability, with the trimaran variant consistently higher across the various stakeholder groups. The concept design evaluation resulted in a determination to undertake further design activities and prepare the Business Case to Government on the trimaran variant.

6.4 Preliminary Design

From April to October 2023, the Vessel Designers have completed preliminary design activities involving the definition of hullform, structure, arrangement, major system definition and schematics. The preliminary design review by AIMS and project stakeholders assessed the design package against the FPS and the maturity of the preliminary design as a basis for detailed design.

6.4.1 Design Refinement Decisions

Preliminary design commenced with working-group feedback on the selected trimaran concept. A recurring theme related to available space in science labs and vessel mess areas. Coinciding with a DNV determination that the modular containers

would be included in vessel gross tonnage, the design and project teams undertook feasibility analysis into the effect of removing the 500 GT tonnage cap. A concurrent manning assessment confirmed that no additional crew beyond AIMS proposed manning was required with an increase above 500 GT. Based on the feasibility and manning results, the tonnage cap was removed from the design requirements.

The vessel's size was increased, providing significant improvements to main-deck layout and accessibility, increased science, cabin and machinery spaces, together with a higher level of buoyancy.

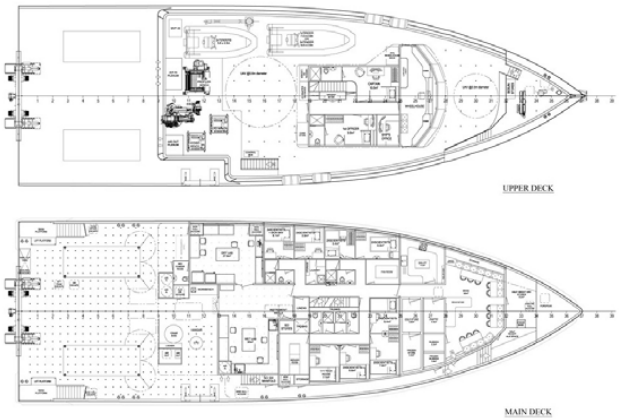

Figure 9: Trimaran General Arrangement
(Drawing courtesy AIMS)

Table 5: Trimaran dimensions between concept and preliminary design

	Unit	Concept Design	Preliminary Design
Length, overall (LOA)	m	42.87	45.00
Beam, extreme (B)	m	14.50	14.80
Depth (D)	m	4.32	4.85
Draft, extreme (T)	m	2.88	3.00
Displacement (SDL)	t	339	375
Gross tonnage (including containers)	GT	499	556

Computational fluid dynamics (CFD) analysis was conducted to consider the vessel's proposed hull shape. Two models were selected, with the primary difference being a wider and shallower centre hull to provide additional buoyancy and machinery-room spaces. Resistance results from CFD confirmed that the wider shallower centre hull was more efficient, and this shape has been selected for the Preliminary Design.

6.4.2. Features of the Design

LARS and Water Access

Unlike traditional deep-water high-latitude research vessels, the AIMS vessel requires a high level of tender deployment to support diving, manual organism collection, reef surveys and restoration work, with up to five manned tenders onboard in addition to concurrent ASV operations.

Launch-and-retrieval systems (LARS) for tenders, along with embarking equipment and personnel, is an important activity with safety concerns identified by the project team and science user groups. Several potential LARS were conceived and evaluated collaboratively with AIMS, resulting in a solution involving two stern boarding platforms featuring lifting platforms, supported by cranes and A-frames with LARS capabilities.

Figure 10: Trimaran water access general arrangement
(Image courtesy AIMS)

Figure 11: Trimaran aft deck general arrangement
(Image courtesy AIMS)

Aft Working Deck

To satisfy the diverse range of science use cases, the aft working deck functions as a modular and multi-use space, with arrangements including:

- 3×20 ft ISO containers and supporting services—for additional lab spaces, accommodation, workshops, storage, dive support, ASV support, and sea simulator in a box;
- fitted with deck sockets and container mounting sockets;
- main crane—maximum lift capacity of 3.59 t at 16 m radius, with the ability to embark containers over the side;
- 10 t lift aft A-frame and 1 t lift side A-frame;
- 6 t lift main winch and 1 t lift hydrographic winch with 2000 m non-conducting cable; and
- 1 t lift CTD winch with 2000 m conducting life cable.

Additional external arrangements include:

- 2.7 t lift tender davit;
- 500 kg lift stores crane;
- spacious hangar with permanent storage of CTD and workshop area;
- 4×5.8 m tenders or 3×5.8 m and 1×7 m tender, with additional tender capacity on top of containers; and
- drone landing clear areas—5.6 m and 3.5 m wing diameters.

Alternative Fuels

AIMS, as a responsible environmental agency, is seeking to drive down fossil-fuel usage and greenhouse gas emissions. This goal has several challenges, in particular the 3000 n mile range requirements and the relative isolation and lack of refuelling options across the top end of Australia.

Table 6: Alternative fuels study

	Baseline	**Alternative Fuels**					
Driving requirements	Marine diesel oil	Batteries	Bio diesel	Hydrogen	Methanol	Ammonia	LNG
3000 n mile range	✓	×	✓	×	×	×	×
21 days endurance	✓	×	✓	×	×	×	×
Bunkering availability (1=available, 5=sporadic)	*	**	*****	*****	***	****	**
On board storage requirements	100%	NA	No modifications required	2000-2600% (gaseous) 800-1050% (liquid)	100%	300-550%	250-350%

Most alternative fuels are not suitable for the AIMS requirements of a remotely-operating workhorse research vessel. However, provision of solar panels and a wind turbine on the wheelhouse roof will provide a small but consistent contribution of renewable energy every day of the mission, irrespective of voyage duration or location, however remote.

Diesel Hybrid

In addition, the vessel is fitted with the MAN Marine Hybrid package, comprising a 750 kW diesel engine coupled with in-line 200 kW e-motors fitted between main engines and gearboxes. The e-motors can be used to generate supply of the ship's electrical loads without needing to run any auxiliary generators during long-distance transits and some survey operations. Another use for the hybrid system is that the e-motors can provide precise slow-speed manoeuvring propulsion power when the engines may be offline, using electrical power from gensets or alternative energy sources. The vessel is fitted with a 124 kWh battery bank which feeds a hybrid panel supplying power to services.

Figure 12: Trimaran at preliminary design stage
(Image courtesy AIMS)

Table 7: Vessel particulars at preliminary design stage

Particular	Value
Length (overall)	45 m
Length (waterline)	43.85 m
Beam (extreme)	14.80 m
Depth (moulded)	4.85 m
Draft (extreme, full load)	2.97 m
Crew	8
Scientists	14+4
Fuel	56 200 L
Fresh water	9500 L

6.5 Detailed Design

From November 2023 to June 2024 the Vessel Designers will conduct detailed design activities. They will develop the approved preliminary design data in more detail to prepare the design for production. Elements of the detailed design package will be attached as appendices to the shipyard RFT documentation.

7. Challenges in Construction

7.1 Shipyard and Modular Capability Constructor Selection

The Federal Government has provided funding for AIMS to develop the design and detailed Business Case for a new vessel, containerised modular capabilities and supporting infrastructure. Therefore, the process to select and potentially contract a shipyard to build a vessel, and manufacturers to build modular capabilities, is a two-stage procurement process.

The first stage, EoI, is currently underway and used to develop a shortlist of shipyards or modular capability constructors and inform the Business Case to Government. The second stage, RFT, will be conducted only once approval has been granted by Government to proceed to the delivery phase of the program. RFT documentation will be based on the more-detailed design. RFT, if project approved, is scheduled to be released to shortlisted respondents on AusTender in July 2024.

7.2 Challenges and Constraints in Construction

The choice of an aluminium trimaran may limit the number of shipyards which can construct the vessel due to the added complexity and being less common than monohull or catamaran vessels. Aluminium shipbuilding adds complexity of the management of material contamination and weld process certification. For longevity and structural integrity of the vessel, a shipyard with extensive aluminium construction experience is required.

Research vessels are complex and involve the integration of high-end science sensors, launch-and-recovery systems, and extensive IT and communications equipment. Construction experience in the integration of this type of equipment will be crucial to the safe and efficient operation of these systems. Shipyards and modular capability constructors which seek to engage with AIMS stakeholders during the construction process will reduce risks around the integration of these systems into the supplies.

With the inclusion of the Business Case process, the procurement phase for the delivery of the vessel and modular capabilities is longer than usual and presents a significant risk which AIMS acknowledges. However, there is an opportunity for contractors to understand program requirements and develop their capabilities and supply chains to deliver high-quality products to schedule and budget.

8. Conclusion

The Australian Institute of Marine Science faces the critical task of replacing the two existing aging research vessels with a state-of-the-art research vessel which can meet current and future research needs. This paper has addressed program challenges associated with the development of a Business Case for approval by Government, the schedule constraints around delivering a new vessel before the retirement of an existing vessel, the engagement of stakeholders, the development of complex requirements, and the two-stage procurement process for selecting shipyards and modular capability contractors.

During the Concept Design stage, three vessel concepts were created—a monohull, catamaran, and trimaran. All three concepts were fully compliant with AIMS stated requirements. The trimaran was selected and has been further developed during Preliminary Design, where various challenges arose, and decisions were taken which impacted the design. The most significant decision was to eliminate the 500 GT limit, which allowed the design team to revise, expand and improve accommodation, working lab, machinery spaces and a larger aft deck allowing the storage of three 20 ft ISO containers. A MAN 200 kW Marine Hybrid package provides benefits in lifecycle costs initially, and broadens the potential to incorporate future trends and advancements in alternative-energy sources as the technology evolves and supply chains strengthen.
AIMS' commitment to research excellence, environmental sustainability, and stakeholder engagement will be pivotal in ensuring the successful development and operation of an innovative trimaran vessel which will continue to drive advancements in marine science while minimising its impact on the environment.

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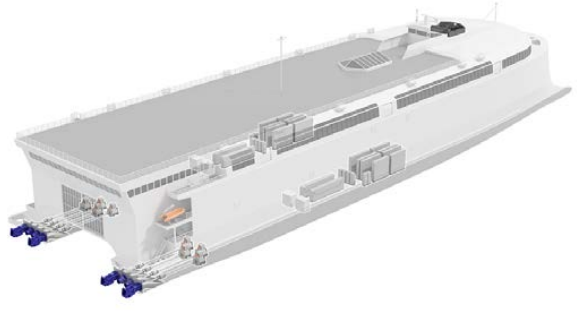
Incat Tasmania selects Wärtsilä Solutions for World's first Zero-emissions Ferry

Technology group Wärtsilä will power the biggest battery-electric ship ever built with its battery-electric propulsion system and waterjets. The vessel is a new ferry being built by Incat Tasmania and has been ordered by Incat's long-term South American customer, Buquebús. With an overall length of 130 m, the ferry will be the largest-ever vessel of its type. It will also be the world's first zero-emissions, lightweight catamaran. The order with Wärtsilä was booked in July 2023.

The uniquely-designed vessel will be fully battery powered, with e-motor driven Wärtsilä waterjets as the main propulsors. The battery modules and energy-storage system package, to be supplied by Corvus Energy, is four times larger than on any electric/hybrid ship currently operating.

"We are very happy to have taken this big leap forward towards decarbonised operations. Incat Tasmania has always been at the forefront of innovating and pioneering new technology and design, and this project further cements our market position. The design addresses the market's needs and requirements by utilising batteries, making it a very viable option for owners and operators looking to increase the sustainability of their fleets. We would also like to thank Wärtsilä for supporting us with an extremely efficient, completely integrated propulsion package, and are really looking forward to working with them to make this project a huge success," said Robert Clifford, founder and Chairman of Incat.

"The overall high-efficiency of this next-generation ferry represents a game-changing advance in catamaran design. We are proud to have contributed our strong know-how in integrating our ship electrification solutions and propulsion equipment. The battery power pack which we are supplying will be the largest ever supplied with a unique eight waterjet propulsor configuration. The eight e-motor waterjet propulsion configuration is the most efficient available on today's market for this speed range and type application while boasting all the benefits from Wärtsilä's axial-flow waterjet technology—low weight, shallow draft, superb manoeuvrability, and low maintenance," commented Roger Holm, President of Wärtsilä's Marine Power business.



Wärtsilä will power the biggest battery-electric ship ever built with its electric propulsion system and waterjets
(Image courtesy Wärtsilä)

The full Wärtsilä scope of supply includes Wärtsilä's own energy-management system, the power-conversion system, DC shore charging system, the 40 MWh battery modules, the DC hub, the eight electric motors, eight Wärtsilä axial-flow WXJ1100 waterjets, and the ProTouch propulsion control system. Delivery of the Wärtsilä equipment is scheduled for the latter part of 2024, and the vessel will be delivered in 2025. The vessel will operate between Argentina and Uruguay. It will carry 2100 passengers and 225 vehicles.

Babcock and HII team in Australia to Support Goals of AUKUS Agenda

Babcock and HII of the US have combined forces in Australia, working together to support critical capability requirements for the once-in-a-generation AUKUS nuclear submarine programme.

This partnership combines world-leading experience from Australia, the United Kingdom and the United States and builds on the existing agreement between both companies to partner in the UK and USA on nuclear decommissioning, disposal and national security opportunities.

Babcock and HII will collaborate to develop the optimal models for nuclear-powered submarine capability, including infrastructure, sustainment and the necessary skills development, to support the AUKUS endeavour. The parties will engage Australian industry to optimise specific solution sets and provide a true tri-lateral offering.

Babcock's CEO, David Lockwood, said "Working with HII in Australia to support the critical capabilities required to deliver the AUKUS programme is the next important step in our relationship and significantly strengthens our Australasian business.

"By harnessing Babcock's heritage and capabilities to accelerate the development of sovereign capability in Australia, alongside HII's extensive experience and expertise as America's largest shipbuilding company, Babcock is strategically positioned to support the Australian Government in the delivery of this critical programme. National security has never been more important and now more than ever, what we do matters."

Babcock and HII are trusted defence companies with decades of experience supporting the UK and the USA's submarine fleets.

Navantia Australia wins Platform-systems Design Contract for Hobart-class Destroyers

Navantia Australia has been contracted by the Commonwealth of Australia as the Platform Systems Designer for the SEA4000 Phase 6, Hobart-class destroyer combat systems upgrade.

Navantia Australia's Managing Director, Israel Lozano, said that the engagement as Platform Systems Designer is a major achievement for the company and will drive significant growth.

"All of the platform design and engineering work is being performed in Australia by Navantia Australia personnel, located in either Navantia's Naval Design and Engineering

Centre in Docklands, Melbourne or in Navantia Australia's offices in Sydney," Loano stated.

The Destroyer Capability Enhancement program is a major upgrade to the Hobart-class destroyers and will require significant industrial resources and collaboration from industry partners, including Navantia Australia, Lockheed Martin Australia, Saab Australia and BAE Systems Australia, working with Defence.

Navantia Australia will support and work closely with the Combat System Integration—Integrated Project Team (CSI-IPT) under the recently signed CSI Collaboration Agreement (CCA) for the integration of combat system elements in the destroyers.

The firm will also collaborate with Saab Australia for the integration of the Australian Interface, a system based on Saab's in-service 9LV Combat Management System through the CSI-IPT.

"For over 20 years, we have worked hand-in-glove with Navantia to successfully integrate the Aegis Weapon System into multiple classes of frigates around the world as well as test and validate the Aegis capability to deliver an unmatched IAMD capability edge to our customers," Lockheed Martin Australia's Vice President of Operations Rotary and Mission Systems Australia and New Zealand, Steve Froelich, stated.

"We look forward to working with Navantia, Saab Australia, and Australian small-to-medium enterprises to bring the latest Aegis capabilities to the Royal Australian Navy's Hobart-class guided missile destroyers."

Navantia Australia will perform the Platform Systems Designer role for modernisation of the combat system, including the development and coordination of the design aspects of the platform system; development of the ship installation design products, including ship's engineering drawings and Ship Alterations packages; and related engineering change artefacts.

HydroComp PropElements® 2023 Released

PropElements was developed not only for propeller specialists and manufacturers, but for naval architects and vessel designers as well. It provides a key optimising design stage between specification of principal parameters for vessel-propeller-drive system matching and full 3D design for manufacture. The initial release of HydroComp PropElements 2023 offers new features across applications and workflows.

New 3D Views and Exports

New *3D render* and *3D mesh* views provide additional visualisations for presentation and confirmation of geometry. The 3D render can be saved as an IGES geometry file and an image file (currently BMP). Export of the mesh as a 3D STL triangular faceted panel file can offer a direct path of the geometry to most CFD/FEA tools and 3D printing without intermediate CAD manipulation.

Improved Calculation for Low-J High-thrust Applications

Propeller codes universally have had difficulty accurately predicting thrust and power performance (K_T-K_Q) for open propellers at low-J high-thrust conditions. Even CFD codes struggle with this, particularly with high-pitch propellers. Reliably delivering accurate predictions across the entire advance coefficient speed regime has always been a priority for us. New updates further enhance PropElements accuracy with updated models for stall/separation and the influence of jet compression on performance. The K_T-K_Q utility now also identifies where stall/separation is indicated (as shown below by red figures in the K_T column).

J	Rn07R	KT	KQ	EFF	CT	
0.050	1230000	0.5454	0.07719	0.0562	555.5753	9
0.100	1230000	0.5135	0.07315	0.1117	130.7724	1
0.150	1230000	0.4796	0.06871	0.1666	54.2771	3
0.200	1230000	0.4493	0.06491	0.2203	28.6024	1
0.250	1230000	0.4218	0.06160	0.2724	17.1851	6
0.300	1230000	0.3971	0.05877	0.3227	11.2363	3
0.350	1230000	0.3740	0.05619	0.3707	7.7739	2

The updated K_T-K_Q utility
(HydroComp image)

Strategic Fleet for Australia

The Commonwealth Government has released the report of the Independent Taskforce on the Strategic Fleet. The Government Response released on 8 November outlines the Government's commitment to delivering a Strategic Fleet of up to 12 vessels which will help Australia build resilience to freight disruptions while supporting our maritime workforce and sovereign capability.

Australia's maritime sector has long been neglected with a shortage of Australian-flagged ships and a skilled workforce. The Taskforce found that the proposed fleet would be able to be relied on in times of national crisis and emergency, helping get vital goods to affected regions and making us less reliant on international shipping.

The Strategic Fleet Taskforce comprised representatives from the Australian shipping industry, unions, the business sector, and the Department of Defence. The report provides 16 recommendations in total and the Government has agreed to 12 of them in full or in principle, while committing to continue exploring the remaining four.

The Federal Minister for Infrastructure, Transport, Regional Development and Local Government, the Hon. Catherine King MP, said "We are getting on with the job of revitalising Australia's long neglected maritime sector.

"The creation of a Strategic Fleet will build Australia's resilience, and protect our national security and economic sovereignty by enabling the movement of cargo in a time of crisis."

The public version of the Taskforce's report is available at: www.infrastructure.gov.au/department/media/publications/strategic-fleet-taskforce-final-report

The Government's response is available at:
www.infrastructure.gov.au/department/media/publications/australian-government-response-strategic-fleet-taskforces-final-report.

EDUCATION NEWS

UNSW Canberra

First Graduate

Semester 2 has concluded and, with it, we celebrate the first completion of all courses in our naval architecture program. Our first graduate from the program, SBLT Cooper Woods, has finalised and presented his design of a 106 m corvette (see Figure 1), submitted his research project and is preparing to head to HMAS *Cerberus* for six months before joining a ship as a marine engineering officer.

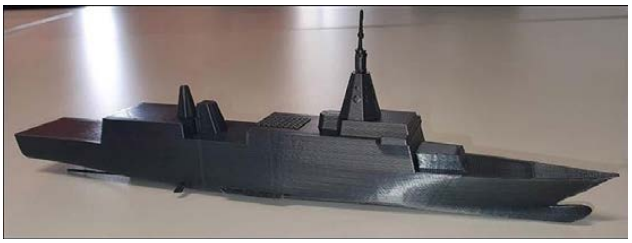


Figure 1: Model of SBLT Cooper Woods' Corvette
(Photo courtesy Warren Smith)

Cooper began his studies as a civil engineering student in Queensland but transitioned to mechanical engineering and subsequently naval architecture at UNSW Canberra at ADFA, after joining the Royal Australian Navy in 2019. His university journey is, in part, an example of the pathway open to others as a function of our 2 + 2 model, allowing students in mechanical or aeronautical engineering programs to transfer for their Year 3 to UNSW Canberra to complete a naval architecture degree. It is noted that this pathway is open to Australian and New Zealand civilian students as well as those in uniform in the Australian Defence Force (ADF).

Cooper has been an excellent student and, in 2022, Cooper was awarded the Petro Fedorczenko Prize for the most outstanding Year 3 Midshipman or Officer Cadet in the fields of both military and academic achievement, continuing on to a Year 4 of study at ADFA in either Honours or Engineering. He used the attached cash award to support a visit mid-year to Navantia in Spain, contextualising his naval architecture studies. Our thanks are expressed for Navantia Australia's collaboration with us and their support in helping organise and coordinate Cooper's visit.

Cooper gained a deeper understanding of the shipbuilding process and saw, on the ground, the efforts and technologies which go into developing state-of-the-art naval vessels. Cooper began his tour in Madrid, travelling to Cadiz where he saw the San Fernando and Puerto Real shipyards before finishing up at the Ferrol Shipyard. During his tour, Cooper was able to witness the first block of the F-110 frigate and the Royal Saudi Navy corvettes being constructed which, he noted, was exciting to see as it was similar to a ship he was designing in his own program at the time. Cooper had the opportunity to learn about the history of Navantia's long-established shipyards, touring the workshops and following the building process from cut steel to assembled blocks.

We are certainly proud of Cooper's achievements which have culminated in his presenting the findings from his final-year research project at the Indo Pacific International Maritime Conference. His project was supported by DSTG (Dr Christian Rayes) and his paper is *Platform Performance of a Hypothetical Corvette with Varying Integrated Mission Packages for Naval Operations*. The aim was to facilitate the determination of feasible mission package solutions for various vessels. This was accomplished using a modelling and simulation environment known as ModelCenter, and by his developing an appropriate network of analytical modules to explore the relevant naval architectural design space associated with the "what-if "questions posed.

SBLT Cooper Woods presenting the findings of his final year research project at IMC2023
(Photo John Jeremy)

Associate

We are similarly proud of the achievements of an "associate" of our program, Brett Murray who, as a Year 4 mechanical engineering student, also presented his final-year research project at the Indo Pacific IMC. Brett's paper is *Development of Wave Making Capability in UNSW Canberra's SET Flume*. With a view to exploiting the existence of a recirculating flume in the School for naval architecture demonstrations and experiments, Brett's contributions have included the refinement and control of our wave-making capability, the measurement and characterisation of the waves produced, and the development of an adjustable beach to reduce reflections. The visualisation possible of performance of a model in the flume environment is demonstrated in Figure 2.

Figure 2: A 1:72 Armidale-class Patrol Boat model in regular waves in the SET Flume
(Photos courtesy Warren Smith)

Guest Lecturers

We are also appreciative of the contributions which guest lecturers have made during the semester:

- Jonathan Windsor (DNE) on ship structures;
- Phil Helmore on propulsion and propellers;
- Paolo Orefice (DNE) on survivability and vulnerability;
- Martin Renilson on submarine hydrodynamics and design;
- Paul O'Connor (BV) on structures and class;
- Richard Milne (DNE) on hydrodynamics; and
- CDRE Grant McLennan and Roger Duffield (NCB) on construction and shipyard practice.

Progression

Our Year 3 cohort is progressing to Year 4 in 2024 and discussions are underway around the focus and scope of research and design activities which lie ahead of them. They also enjoyed attending the Indo Pacific IMC in November.

Finally, we look forward to greeting a new group, as our third wave, and welcoming them into Year 3 in 2024. It will be made up of those already studying at UNSW Canberra at ADFA, expected to be four or five in number and, hopefully, some transferees, perhaps sponsored by industry.

A/Prof. Warren Smith
Naval Architecture Program Coordinator
School of Engineering and Technology
UNSW Canberra @ ADFA

Australia-UK Strategic Alliance on Research and Innovation

Australia and the United Kingdom's leading research universities have signed a formal agreement to increase two-way research collaboration, boost commercialisation activity and build trusted partnerships in areas of sensitive research.

The signing of the *Australia-UK Strategic Alliance on Research and Innovation* follows a series of dialogues between the Group of Eight (Go8) and the Russell Group, the most recent held in Sydney in late September, aimed at leveraging the Australia-UK Free Trade Agreement and advancing research engagement around AUKUS Pillar II priorities.

Increasing two-way research collaboration is not only key to boosting trade and investment to support the economic growth of both nations, but also critical to delivering the advanced capabilities identified under Pillar II of AUKUS, including Artificial Intelligence, Undersea Capabilities and Quantum Technologies.

University research is fundamental to achieving our bilateral goals and our ability to remain competitive in a world increasingly driven by knowledge and technology, and in which protecting national security has become paramount.

This agreement will shape our engagement with our respective governments to leverage opportunities provided by the A-UKFTA, and address identified barriers to greater research collaboration.

Research security and AUKUS-related research engagement are both top priorities for our world-class universities, not just for their research excellence but also for the high-level skills which they develop for our respective economies and for their strengths in turning research into innovation.

The Go8 and the Russell Group are their country's key representative body for world-class research-intensive universities, with the eight members of the Go8 accounting for more than 70 per cent of Australia's university research activity and, comparably, the 24 members of the Russell Group producing 68 per cent of the UK's university research activity.

Investing in our Defence Industry Workforce for the Future

On 10 November the Acting Prime Minister and Minister for Defence, the Hon. Richard Marles MP, and the Premier of South Australia, the Hon. Peter Malinauskas MP, released the South Australian Defence Industry Workforce and Skills Report and Action Plan, delivering a detailed strategy to grow and sustain South Australia's defence industry workforce for the future.

This plan will ensure the necessary support for the delivery of some of the nation's most complex defence projects, including Australia's conventionally-armed nuclear-powered submarines and continuous naval shipbuilding.

These capabilities will only be realised through the strength of a highly-educated and highly-trained workforce, equipped with cutting edge skills for the future.

The Report details 22 initiatives to further address workforce challenges and grow the South Australian defence industry workforce from 3500 direct jobs to more than 8500 in the 2040s.

These tangible and solutions-focussed initiatives will:

- Engage an estimated 27 000 students and 1500 teachers in at least 180 South Australian schools to support STEM education pathways for students.
- Establish an industry capability pipeline of around 2600 additional VET and university students through flexible training programs, technical colleges and STEM-focused higher-education places.
- Employ more apprentices, graduates and undergraduates through the Early Careers Program with more than 70 young Australians to join the program this year.
- Engage and upskill experienced workers and industry leaders through mid-career transition programs, the Skills and Training Academy and Defence Industry Leadership Program
- Improve workforce data and insights across industry and government
- Promote defence industry workforce opportunities, and better connect jobs with potential candidates through a multi-tiered communications strategy.
- Strengthen STEM evaluations through a consistent methodology and support industry to sponsor security clearances to engage highly-skilled workers from our AUKUS partners.
- Growing the defence industry workforce in South Australia requires a coordinated and collaborative approach.

Implementation of the package of initiatives will commence from 2024.

AMSA

Survey Matters

Survey Matters is AMSA's e-Newsletter relating to domestic commercial vessel (DCV) survey and is published approximately six times per year. You can request placement on the mailing list by emailing DCV Survey <dcvsurvey@amsa.gov.au>. The e-Newsletters are now also available online at

https://www.amsa.gov.au/news-community/newsletters#collapseArea612

Items included in the August 2023 e-Newsletter included:

- Focused certification campaign 2023-24
- Guidance for recognised organisations making initial survey recommendations
- Electrical matters
- Updates to Exemption 44
- NTSB Report—doubler-plated hull repairs
- Changes to operational safety requirements

The article on *Guidance for recognised organisations making initial survey recommendations* is partially reproduced below. For full details, see https://www.amsa.gov.au/news-community/newsletters/survey-matters-august-2023.

Phil Helmore

Guidance for Recognised Organisations making Initial Survey Recommendations

When a vessel is classed with a registered organisation (RO) [*e.g. a classification society*—Ed] and intends to operate as a domestic commercial vessel (DCV), an application for a certificate of survey is required. The operator will be sent a letter containing a list of surveys which are to be completed and recommended by an Accredited Marine Surveyor (AMS) or an RO surveyor.

While documentation which shows that a vessel was built in accordance with class rules demonstrates compliance with some aspects of the National Law, it does not cover all the requirements. The owner must ensure that the aspects which are not covered by its certificate of class are surveyed. An owner can employ an independent AMS to survey those aspects on vessels less than 35 m long; however, it is common for the RO to complete all the initial surveys for a vessel.

Further information and detailed instructions can be found in Chapters 3 and 5 of the Marine Surveyor's Accreditation Guidance Manual (SAGM) Part 2 or via the initial certificate of survey applications page on the AMSA website.

What is Covered by a Certificate of Class?

A certificate of class is accepted by AMSA as evidence that the vessel complies with the following aspects of initial survey:

- Hull structure (NSCV Part C3)
- Machinery (NSCV Parts C5A, and C5C)
- Electrical (NSCV Part C5B)
- Anchoring (NSCV Part C7D)

What is Not Covered by a Certificate of Class?

The following parts of the NSCV need to be specifically addressed as they apply to the vessel for plan approval, construction, and commissioning phases of initial survey, in addition to the classification component above.

- Arrangement, Accommodation, and Personal Safety (NSCV C1)
- Watertight and Weathertight Integrity (NSCV C2)
- Fire Safety (NSCV C4)
- Stability (NSCV C6A, C6B and C6C)
- Safety, Navigation, and Communication Equipment (NSCV C7A, C7B and C7C)

Further details of each of these items are given at https://www.amsa.gov.au/news-community/newsletters/survey-matters-august-2023.

What Documentation to Submit to AMSA?

The Marine Surveyor's Accreditation Guidance Manual (SAGM) Part 2 Chapter 5.4 gives a list of documents to be submitted by an RO to cover those aspects for which classification is accepted, i.e., hull structure, machinery, electrical, and anchoring.

For aspects which are not covered by classification, the list of plans and supporting documents given in Chapter 3.9.2 and Table 2 can be used as a guide. A plan approval letter which addresses the parts of NSCV C1, C2, C4, and C6 that apply to the vessel, and referring to the relevant vessel plans, must be submitted with copies of the approved plans and documents.

Which AMSA Forms to Complete?

AMSA has produced forms which relate to each survey code to enable easier reporting of surveys. Annex 1 of SAGM Part 2 gives a reference table of forms which relate to each survey code. The forms can be downloaded from the AMSA website.

Surveyors may also make their recommendations on their own equivalent forms if all the same information is provided.

How to Submit?

Surveyors from recognised organisations can arrange for access to the MARS online system by contacting OSS@amsa.gov.au. MARS enables surveyors to upload survey reports and supporting documents directly to AMSA resulting in applications being processed faster.

AMSA no longer uploads reports on behalf of surveyors, other than for electrical surveys. If the RO is submitting electrical survey reports on behalf of a licensed electrician, these can be emailed directly to dcvapplications@amsa.gov.au.

Survey Matters, August 2023

MEMBERSHIP

Australian Division Council

The Council of the Australian Division of RINA met on the afternoon of Tuesday 12 September 2023 by zoom-conference under the chairmanship of our President, Jim Black, in Perth with links to Gold Coast, Sydney, Canberra, Melbourne, Hobart and Adelaide.

In opening the meeting the President congratulated Omar Hostia Sotil on joining Council to fill a casual vacancy.

Among the items discussed were:

Lower Secondary Brochure

Council approved the draft brochure and, subject to obtaining suitable quotes, authorised its printing for distribution by Sections and at the upcoming Indo Pacific IMC. Soft and hard copies of the brochure may be obtained from the Secretary by request.

Walter Atkinson Award 2023

Council noted that the panel considering papers for this Award had not yet completed its work. The Panel advised Council following the meeting that no eligible paper had met the criteria for a winner and Council subsequently agreed that no Award should be made this year.

WARSHIP 2024

Council welcomed a progress report on bringing the Institution's flagship annual Warship Conference to Adelaide on 18–19 June 2024 as flagged in a "stop press" insertion in the August edition of *The ANA*. The flyer for this conference, to be themed "Future Surface Combatants", is reprinted in this issue.

Initial indications are that the Conference will have a full program of papers in streams on both days. Council thanked Andy Harris of the Conference sponsor BMT for his work so far in setting-up the Conference.

Maritime Engineering Related Secondary Courses

Council continues its work in establishing contact on this subject with State Departments of Education. The work is being led by the Improvement Committee.

The discussion at the Council meeting covered the fact that there was some crossover between relevant TAFE and secondary courses.

Victorian/Queensland Engineer Registration

Council received a progress report indicating that Queensland re-approval as an assessment entity was expected in the near future, but there had been some difficulty in communicating with Victoria on the progress of our application.

Annual Membership Report

Council noted that membership had been maintained at a very similar level to the corresponding time last year.

Management of Assets

Council received a report that the Investment Committee had successfully completed establishing a fund to manage and grow the Division's assets.

Government Initiatives

Council noted that the forthcoming report by US VADM Halarides into the future structure of the RAN fleet following the Defence Strategic Review was due to be presented to the Government later in the month and that the possible need for a RINA response would depend on the subsequent Government response.

Improvement Committee

The Committee continues its work, now under the leadership of our new Vice President, Prof. Jonathan Binns.

Indo-Pacific 2023 IMC

Council received a report indicating that all preparations for the IMC and the Exposition with which it is associated were now in place. [*Reports of the IMC in particular are provided elsewhere in this issue, while AMDA, organisers of the Expo, reported it to be the biggest to date by a significant margin*—Ed.]

The draft minutes of the meeting have been circulated to Council members and are available to other members by request.

Rob Gehling AO
Secretary
rinaaustraliandivision@gmail.com
0403 221 631

New RINA Website

RINA HQ is working hard on the new website, and it is expected that branch and section pages will be up and running by the end of November.

Changed contact Details?

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

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

RINA London	hq@rina.org.uk
Australian Div.	rinaaustraliandivision@iinet.net.au
Section ACT	rinaact@gmail.com
NSW	rinansw@gmail.com
Qld	rinaqlddiv@gmail.com
SA/NT	rinasantdiv@gmail.com
Tas	tassec@rina.org.uk
Vic	vicsec@rina.org.uk
WA	wa@rina.org.uk

Phil Helmore

THE INTERNET

RINA Webcasts

The RINA YouTube channel is at

https://www.youtube.com/channel/UChb1sfHbWfQmG-iwpp_QGJg

Bookmark this website and keep your eye on it!

Video recordings of Australian section presentations should be sent to Abigail Forbes and Klaudia Rogala-Haracz <marketing@rina.org.uk> at RINA HQ for uploading.

To find a recording of an Australian section presentation, click on Playlists in the menu bar. Branch and Section presentations are shown fifth from the left in the top line. Click on *View full Playlist* to see the list which is in approximate date order, with the most-recent first. For an older presentation you may scroll down through the list; however, if you know the name of the presentation, then click in the search box at the top, type the title of the presentation you are looking for (or at least the first three words thereof) and press Enter.

NSW Section Webcasts

- The NSW Section webcasts recorded and uploaded within the last three months are:
- *Electric-drive Technology for Tugs—The Future is Now*, presented by Tom Charter, Damen Shipyards Representative for Australia, New Zealand & South Pacific, and Sale & Purchase Manager with Australian Independent Shipbrokers/Asiaworld Shipping Services, to a joint meeting of the NSW Section and the IMarEST ACT & NSW Branch in the Harricks Auditorium at Engineers Australia's new premises at 44 Market St in the Sydney CBD and streamed live on 9 February.
- *Finite Element Analysis: Computed Prediction vs Reality*, presented by Sean Langman, Managing Director, Noakes Group, to a joint meeting of the NSW Section and the IMarEST ACT & NSW Branch in the Kirribilli Room at the Royal Sydney Yacht Squadron, Kirribilli, and streamed live on 5 April.
- *Seaworthiness Assurance in The Royal Australian Navy*, presented by CAPT Sands Skinner, Director, Navy Materiel Seaworthiness Assurance Agency, to a joint meeting of the NSW Section and IMarEST ACT & NSW Branch in the Henry Carmichael Theatre, Sydney Mechanics School of Arts, Sydney, and streamed live on 3 May.
- *The Australian Future Submarine Multiverse*, presented by Eric Fusil, Program Director Marine Engineering, the University of Adelaide, to a joint meeting of the NSW and SA& NT Sections and the IMarEST ACT & NSW Branch in Room S112, Engineering South Building, the University of Adelaide, and streamed live on 5 June.
- *HMAS* Choules—*Capability Assurance Programme*, presented by Lachlan Rowley, Engineering Manager, Atlantic & Peninsula Australia, to a joint meeting of the NSW Section and the IMarEST ACT & NSW Branch in the Henry Carmichael Theatre at the Sydney Mechanics School of Arts, Sydney, and streamed live on 5 July.
- *IMO Navigates the Age of Alternative Marine Fuels*, presented by Robert McMahon, Marine Engineer and Energy Consultant/Auditor, to a joint meeting of the NSW Section and IMarEST ACT & NSW Branch in the Henry Carmichael Theatre, Sydney Mechanics School of Arts, Sydney, and streamed live on 2 August.

Phil Helmore

Victorian Section Webcast

The Victorian Section webcast recorded and uploaded within the last three months is:

- *Using Reliability Analysis and Probabilistic Risk Assessment to Achieve Lifecycle Seaworthiness on the Hobart-class Guided Missile Destroyer,* presented by Daniel Johnstone, to a meeting at the Mission to Seafarers in Docklands and streamed live on 16 February 2023.

Samuel Smith

Further recordings will be added to the RINA YouTube channel as they occur.

THE AUSTRALIAN NAVAL ARCHITECT

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

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

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

NAVAL ARCHITECTS ON THE MOVE

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

Jordan Banks has moved on from John Butler Design and has taken up the position of Naval Architect with Chris Tucker Marine Design in Melbourne.

Angus Bratter has moved on from Navantia Australia and has taken up the position of Naval Architect/Project Manager with Flow Tech Australia in Sydney.

Tim Brazier continues as Principal of Brazier Consulting and has taken up the position of Lead Engineer, consulting to Fugro in Perth.

Tom Bromhead has moved on from Maersk Supply Service and, after some time at Toll Group, has taken up the position of Second Officer on board AHTS *Far Senator*, contracting with Atlas Professionals.

Nick Browne has moved on from the Australian Antarctic Division and has taken up the position of Executive Project Manager, RV *Investigator* Projects, contracting to CSIRO in Hobart.

Greg Byrne has moved on from BAE Systems Australia and, after some time at Fortescue Future Industries, has taken up the position of Production Manager with Birdon Group in Port Macquarie.

Martin Cabot has moved on from DOF Subsea and moved to Fugro where he has recently taken up the position of Principal Design Engineer in Perth.

Stuart Cannon has moved on from DST Group and has taken up the position of Assistant Director-General Technology Programs with the Australian Submarine Agency in Melbourne.

Mitch Carmock has moved on within Boeing and has now taken up the position of Systems Engineering Manager in Brisbane.

Levi Catton has moved on within Gibbs & Cox Australia and has taken up the position of Managing Director in Canberra.

Yew Jinn Chieng has moved on from Nuheara and has taken up the position of Naval Architect with International Maritime Consultants in Fremantle.

Tom Dearling has moved on from QinetiQ Australia and has taken up the position of Lead General Design Engineer with Navantia Australia in Melbourne.

Jan de Kat has moved on from the American Bureau of Shipping and has taken up the dual part-time positions of Regulatory Affairs Manager with Mærsk McKinney Møller Centre for Zero Carbon Shipping and Naval Architecture Consultant with Starcrest Consulting Group in Copenhagen.

Adela Greenbaum has moved on from the Department of Defence and has taken up the position of Advisor Emerging Vessel Technology with the Australian Maritime Safety Authority in Canberra.

LCDR James Heydon has moved on within the Royal Australian Navy and is one of the first three Australians to graduate recently from the Nuclear Power School operated by the US Navy in Charleston, South Carolina, in the USA, where he will also become one of the first Australians to operate a nuclear reactor on a conventionally-armed nuclear-powered submarine.

Patrick McManus has moved on from One2three Naval Architects and is taking an extended vacation before evaluating opportunities.

Rozetta Payne has moved on within the Department of Defence and has taken up the position of Director Whole-of-Ship with Navy Engineering in Sydney.

Thomas van Peteghem has moved on from consulting in Paris and has taken up the position of Immersive Learning Expert with Uptale in Sydney.

Lily Webster has moved on within the Naval Shipbuilding and Sustainment Group (NSSG) and taken up the position of Naval Architect in Army Watercraft in Specialist Ships within NSSG with Geodetica in Canberra.

Malinda Wickramaarachchi has moved on from Sofraco Engineering after 17 years, and has taken up the position of Senior Naval Architect with the Australian Maritime Safety Authority in Sydney.

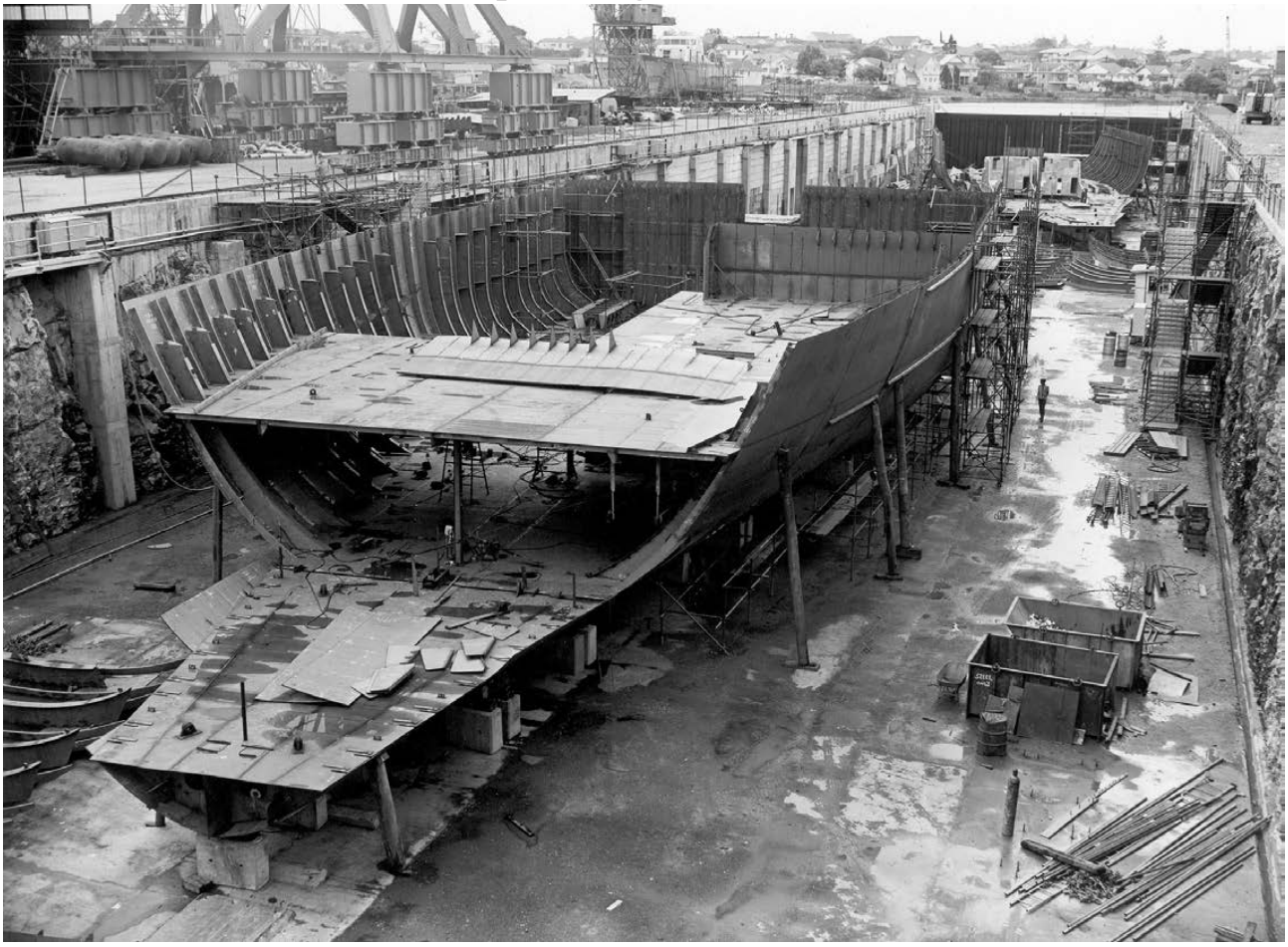
Ning Wu has moved on from Lloyd's Register and has taken up the position of Construction Engineer in the family business, Yuhe Construction Co., involved in civil engineering construction and process piping installation with the petrochemical industry, in Taixing, China.

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.

Phil Helmore

FROM THE ARCHIVES

Shipbuilding in Brisbane



In 1940 the engineering company Evans Deakin established a shipyard at Kangaroo Point in Brisbane. In the 1960s facilities there were expanded by the construction of a building dock 242 m long, 34.8 m wide and 9.4 m deep. This photo shows two roll-on roll-off cargo ships, *Brisbane Trader* and *Sydney Trader* under construction in the dock in the late 1960s
(Photo John Jeremy collection)

The Kangaroo Point shipyard was closed in 1976. The largest ship built there was the 68 218 dwt tanker *Robert Miller*, completed in 1974. The dock was served by a 100 t Butters Crane which was a Brisbane landmark
(Photo John Jeremy collection)

The Australian White Ensign flying over Darling Harbour in Sydney during Indo Pacific 2023. The Cape-class patrol boat *Cape Peron* was berthed in Cockle Bay during the event
(Photo John Jeremy)