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HMAS *Sydney* fiiring a 21-gun salute as she leads six other RAN warships around Bradley’s Head on the morning of 4 October, one hundred years after HMAS *Australia* led the ships of the new Royal Australian Navy into Sydney Harbour for the first time on 4 October 1913
(RAN photograph)

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Cover Photo:

HMAS *Sydney* about to round Bradleys Head during the International Fleet Review in Sydney on 5 October 2013
(Photo John Jeremy)

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From the Division President

The federal election is over, our politicians have swapped benches, and everything seems to be settling back to "normal". I have been encouraged by recent words from our new Minister for Defence, Senator David Johnston, and from the head of Navy Engineering, RADM Mick Uzzell — concerns about "continuity" and "capability" being regularly emphasised. On the other hand, the Australian National Audit Office's recently published report *Capability Development Reform* makes rather depressing reading, analysing as it does the various commissioned reviews of Defence procurement capability which have taken place since 2000 and indicating a disappointing lack of progress in many areas. This, of course, is not exactly news to those of us in the profession, but perhaps we now see a wider understanding of the challenges beginning to develop.

Capability at all levels and areas of the maritime industry will always be a challenge in the Australian context with our small population base, but that is not to say that it cannot be achieved and maintained. I see it as essential that Australia maintains the ability to educate our maritime trades and professions to the highest level, right through from our schools, colleges and universities, to opportunities for apprenticeships, under-graduate training and post-graduate career paths and CPD. I urge all of you, at whatever stage you are in your career, to seize every opportunity which arises to lobby for this capability and, if it is within your remit, to offer such opportunities.

Capability is, of course, not solely personnel based; capable facilities and infrastructure are essential elements also, but it is the people who create them and, if we do not enhance and maintain the appropriate level of skills base, then all such facilities and infrastructure quickly lose their potential value.

Continuity of available work is naturally seen as a requirement to underpin the maintenance of capability, but history has shown us that the shipbuilding industry is probably one of the most resilient when it comes to dealing with the peaks and troughs of demand. While we should continue to lobby government for continuity and smoothing of defence work, we should certainly not see that as our only salvation and must continue to look "outside the box" for alternative and innovative solutions which can ensure that Australia remains a clever country, with the whole maritime sector as a leading light.

Jim Black
President, Australian Division

My two years as president of the Division seem to have flashed by. I have been honoured to have held the position and hope that I have contributed in some small way to enhancing the standing of our profession in Australia. There is much still to be done, not just for naval architects but for all professional engineers in the fields of mutual recognition, registration, and broader acceptance of the essential place of engineers in modern society. This, too, is a task for every one of us!

May I close this column by wishing all of you and yours the very best for the coming Christmas and holiday season, and on into an exciting and challenging 2014.

And finally, as always, I am available for discussion and comment on any topic of relevance to Australian naval architects: by email at jimb@austal.com or telephone 0418 918 050.

Jim Black

Editorial

The first two weeks of October were memorable days in Sydney. The Royal Australian Navy's International Fleet Review and Pacific 2013 provided much of interest and value for those inclined to matters maritime. The weather was (generally) perfect and the crowds were large. For those who were unable to be present we have included several pages of photographs in this edition of *The ANA*.

The Pacific 2013 International Maritime Conference was well attended and the standard of presentations was high. Once again the organising institutions enjoyed the great support of Maritime Australia Limited, our conference partner and organiser of the exposition in Darling Harbour. The next event will be in early February 2016. Pacific 2016 will be an interesting challenge as the Sydney Convention and Exhibition Centre is about to be torn down and rebuilt in time, hopefully, for Pacific 2018. Pacific 2016 will be held at the temporary facilities now being erected at Glebe Island.

Our conferences could not happen without the contribution by the members of the organising and program committees. These members put considerable time into the preparations for the event and deserve hearty thanks for the work they do to ensure that our flagship event is successful.

Now we must get back to work. President Jim Black has written in this edition of the challenges presented by the peaks and troughs in the workload of our industry. This problem has been the subject of much examination recently, particularly in the context of the plans to construct Australia's future submarines.

Peaks and troughs in shipbuilding workload in Australia have been with us for a century. It is easy to imagine that the problem is one peculiar to smaller countries like Australia, or that it is due to some particular Australian failing. Of course, it is not. Even countries like the United States have had to face up to the same challenge, and Britain is right now facing a gap in the naval shipbuilding program as aircraft carrier and Type 45 work concludes. The plans by the principal shipbuilder, BAE Systems, and the UK government to address the problem are reported in this edition of *The ANA* (see p. 48).

The challenge for Australia is similarly pressing. The workload trough starts well before the ships are complete as design and technical activities run down and those areas are some of the most difficult to recover from loss. Of course, there are plenty of people willing to offer solutions. They range from building another air-warfare destroyer (which would not help the technical trough much) to side-stepping the big problem as we approach the future submarine and frigate projects by giving up building big destroyers, frigates and submarines in favour of more patrol boats and 'off-the-shelf' small submarines.

These suggestions are easy to make but ignore the reality that the best-equipped people to decide what we need to defend Australia are those who are responsible for the task. In the same way, those best equipped to suggest how we might sustain skills are usually those whose job it is to provide them. Of course, it is easy to fall into the trap of attempting to always sustain exactly what we have had in the past — as Jim Black suggests, we must not fail to also look 'outside the box'.

John Jeremy

LETTERS TO THE EDITOR

Dear Sir,

I read with interest the UNSW student letters to the editor in the August 2013 issue of *The ANA*. While I am speculating on who the 'non-green' senior executive may have been in the letter from Fergus Hudson, I was particularly drawn to the reference to hydrofoils in two of the other letters.

Syahmi Hashim noted that the hydrofoil trimaran, *L'Hydroptere*, set a new outright sail-speed record in 2009 at 51.36 kn over 500 m. It is worth noting that, in November 2012, *Vestas Sailrocket 2*, which in many respects can also be considered as a hydrofoil, became the new and current outright speed-sailing record holder at 65.45 kn over 500 m. These records and the move of the America's Cup AC72s to full foil support speak volumes for the merit of hydrofoil technology when considering efficiency at high speed.

Syahmi indicated that hydrofoils are sensitive to damage from wave impact or floating objects. True to some extent, but I wonder whether that is any more the case than for other types of lightly-constructed high-speed craft? Over the years I have seen several photos of bent-up catamaran cross structures after they have impacted waves at excessive velocity. I have never seen similar photos for hydrofoils aside from those which have run into sea walls. Supramar, in their advertising brochures, could quite proudly advertise the strength of the bow foils on their surface-piercing craft with a photo of a sizeable log sheared clean in half following a foil impact. The foil was reported to have suffered little damage following that impact.

I am certainly also conscious of the fatal consequences that a foil strike would likely have on marine mammals that enter the path of a foilborne hydrofoil. However, I wonder whether the consequences would be any less for any other forms of high-speed displacement or semi-displacement craft, particularly those equipped with exposed marine propellers. The swept frontal area of such other craft is likely to be similar to that of a foilborne hydrofoil, and an impact with a hull or propeller would likely also be fatal, if perhaps slower. The only solution to minimising such harm would appear to be to significantly limit maximum speeds of such craft, to develop acoustic means to deter mammals from approaching the path of high-speed craft or, perhaps, to install underwater obstacle detection and avoidance systems.

While I have been advised by Australian shipbuilders that passenger hydrofoils would be expensive to build, I certainly don't view their structure as being more complicated than that of catamarans, for example and, once the latter are equipped with ride-control fins and flaps in an effort to reduce their motions in a seaway, they have already gone most of the way towards introducing hydrofoil support anyway! Why not go the full distance and take advantage of the improved transport efficiency that is available from pure hydrofoil support? Ustica Lines in Italy, an established operator of a sizeable fleet of hydrofoil, monohull and catamaran fast passenger ferries, has recently ventured into development of their own hydrofoil design, the first of which is currently in production. For an operator of a range of different ferry types to make this choice again gives an indication of the merit of hydrofoils over other forms of high-speed marine transportation.

Syahmi, why don't you consider undertaking a hydrofoil design project or thesis project in your final year? That would make you eligible for the International Hydrofoil Society (IHS) Mandles hydrofoil achievement prize (see www.foils.org/08%20Mandles%20Prize/mandlesprize.html for further details).

Martin Grimm

Dear Sir,

In 2008 the first offshore wind farm was built and, since then, the popularity of offshore wind farms has increased steadily. This has been stimulated by growing interest in new methods of renewable energy, the abundant space for offshore power stations, and the consistency of offshore winds. However, there are many challenges which need to be overcome in order to safely work in the offshore environment and thus, there are many particular service requirements for both the installation and the vessels needed to maintain them. This is where the system is lacking, with rules regarding both the design and maintenance procedures for these vessels mainly confined to domestic standards, not international regulations.

There is a need for new international class rules and regulations for designers and shipbuilding yards in the production of wind-turbine installation vessels and service vessels in order for the vessels to be safe and efficient. The service vessels frequently transport maintenance personnel and equipment through rough offshore sea conditions to the turbines; this is a particularly dangerous situation and, currently, the onus is on the skipper to time the mooring of the vessel with wave conditions, instead of on designers to make ships fit for this task. Considering the scale of these projects, low-cost options will start to arise soon, and there must be international regulations in place to ensure that these vessels are capable of fulfilling their service requirements safely.

An effort to address this issue was undertaken in early 2011 with the publication of new Det Norske Veritas rules, but the rules are restricted to wind-farm service vessels, and only the Netherlands, Denmark, Norway, Germany and the UK were involved, ignoring large shipbuilding nations such as China. This means that design specifications and safety regulations among the vessels operating on wind farms worldwide are inconsistent, which will invariably lead to problems, perhaps even deaths, in the future.

There are other regulations which should be considered for these vessels, such as energy efficiency and low ecological impact, in order for the entire wind-farm project to be practical and true to its cause. Under international rules, such as the Energy Efficiency Design Index which emerged from the Kyoto Protocol, stringent regulations will mean that new vessels must be cleaner and more energy efficient, but does not require them to be entirely "green". However, the public would expect that a multi-billion dollar renewable-energy facility would be maintained by eco-friendly service vessels, and built in the most environmentally-friendly way possible and these standards must be met.

Molly McManus
UNSW Student

Dear Sir,

I would like to take a moment to describe to you a vessel which never ceases to impress me. A vessel of such majesty and power that I cannot help but be enthusiastic. I am referring to HMS *Vanguard,* Pennant Number 23, the last battleship ever built. Though too late to participate in World War II, she benefitted from the lessons learned from other battleships.

Technically a so-called 'fast battleship', she was designed to have a top speed of 30 kn. Unlike another well known fast battleship, HMS *Hood*, *Vanguard* was heavily armoured; however, most of this was for splinter protection, and her armour was thinner about the waterline due to weight issues.

The earlier King George V-class ships had almost no sheer on the main deck. This allowed 'A' turret to fire straight ahead, at zero elevation. The lack of sheer makes for a poor sea boat. *Vanguard* improved upon this, adding a large amount of sheer and flare to the bow. While this did mean that *Vanguard* had to sacrifice the ability to have 'A' turret firing straight ahead at zero elevation (a situation which rarely came up in a battleship fleet action) she was far more seaworthy. This made her more able to keep an even keel, even in a rough sea. *Vanguard* also featured a transom stern, which was estimated to give her an extra 0.33 kn of speed.

Vanguard was scrapped in 1960 and so, while I never saw her in person, there are a number of photos, paintings, and drawings. In these images I see a gracefully-curved hull, with a style and majesty not seen on modern warships. Despite the irrelevance of the battleship in the modern navy, I can't help but feel saddened that we are unlikely to see warships, such as *Vanguard,* in the future.

Chris Lloyd-Jones
UNSW Student

NEWS FROM THE SECTIONS

Victoria

The Victorian Section of RINA has held a number of technical meetings throughout 2013. These meetings have been held jointly with IMarEST.

***West Java FSRU Project* — Paul Duncan**

In February Paul Duncan provided a fascinating overview of his work as a naval architect and project manager with the floating production systems team at INTECSEA in Melbourne. His team specialise in concept development and Pre-FEED studies on Floating Storage and Regasification Units (FSRU) and have been involved in the majority of FSRUs in operation.

His presentation described the West Java FSRU project, which was based in Jakarta and helped the Indonesian Government select and deliver their first FSRU. The project was executed in a very short timeframe and has paved the way in Asia for short-term energy supply projects.

***Grande Côte Project — Tailings Stacker Design* — Trevor Dove**

In April Trevor Dove from BMT presented his work on the design of a tailings stacker. Several years ago the mineral sands mining industry responded to a global shortage of titanium dioxide with a strong push towards exploration of new mine sites. The Grande Côte project will dominate the landscape of a 100 km stretch of sand dunes north of Dakar, Senegal.

The engagement of an Australian prime contractor for the mine development has paved the way for involvement from Australian sub-contractors and has ensured that their technology will be part of a world-class mine for the next 14+ years.

BMT has had substantial input into the design of the floating plant which makes up the processing system for the mine and the detailed design of a 550 t tailings stacker was the pinnacle of their involvement. Trevor presented an overview of the design process and the challenges involved in dealing with clients in an industry which has, until recently, avoided input from naval architects.

Victorian Branch AGM

The AGM of the Victorian Section of RINA was held just prior to the August joint RINA/IMarEST technical presentation. The following personnel were re-elected unopposed to their respective positions.

Chair	Karl Slater
Secretary	Simon Kelly
Treasurer	Jan Verdaasdonk

***Asset Management via the Baseline* — Jesse Millar**

At the August meeting Jesse Millar from BMT Design and Technology presented his work on asset management.

The term, asset management, summarises many services, so much so that the whole reason for asset management is often lost. What should be clear is rarely fully defined and often covered up by commercial jargon. Defining, interpreting and protecting the asset baseline is the only reason asset management exists, yet rarely is it mentioned when these services are presented.

Baseline management commences from the moment a concept is proposed; however, it is only after construction is complete that asset management services are introduced. At this point it is too late and the baseline will remain undefined with asset management semi-functional at best. As a result, the through-life support of assets occurs at prices well in excess of operational budgets and exposes unnecessary risks to mission capability, safety and the environment.

Such issues have been highlighted recently through critical failures in the sustainment of naval platforms, resulting in non-availability. Band-aid solutions have been applied on many occasions, without a dedicated methodology to ensure that such failures do not repeat. The Baseline Management System (BMS) outlined in Jesse's presentation utilises three critical baselines as the pillars of support:

- maintenance baseline;
- operational baseline; and
- configuration baseline.

Critical to ensuring that the BMS is effective through the life of the platform, the operational baseline is built with its foundations entrenched in a defined and detailed mission statement. Utilising a risk-based analysis approach the mission statement is expanded to develop a systematic Failure Modes and Effects Analysis (FMEA), with subsequent Criticality and Maintainability Analysis to build the Configuration and Maintenance Baselines. Finally, a Reliability, Availability and Maintainability (RAM) Analysis is proposed to define, and refine through-life support.

Once the pillars of support are constructed, the BMS can be employed to provide platform owners with a systematic, defined and refined approach to platform assurance and availability through life. With the foundations being based upon a defined mission statement and risk-based analysis, stakeholders are offered clear visibility of the baseline state of a platform and the requirements for sustainment from cradle to grave.

This presentation was also given at the Pacific 2013 International Maritime Conference

***Searching for a Green Ship in a Blue Ocean* — Nicholas Lawrence**

In October Nicholas Lawrence presented his work relating to ship energy management plans and the work of the IMO.

While international shipping is the most carbon-efficient mode of commercial transport, total emissions are comparable to those of a major national economy, necessitating emission reduction. In 2009, shipping was estimated to have emitted 3.3% of global CO_2 emissions, of which international shipping contributed 2.7% or 870 million tonnes. Moreover, according to the International Maritime Organization's (IMO) Second Greenhouse Gas (GHG) Study, if unabated, shipping's contribution to GHG emissions could reach 18% by 2050.

In July 2011, the IMO Marine Environment Protection Committee (MEPC) adopted mandatory measures to reduce GHG emissions from international shipping through amendments to MARPOL Annex VI Regulations. These amendments include the application of the Energy Efficiency

Design Index (EEDI) for new ships which will require ships to meet a minimum level of energy efficiency. The EEDI applies to all new ships built from 1 January 2013.

From 1 January 2013, existing ships are required to document their energy usage through the introduction of a Ship Energy Efficiency Management Plan (SEEMP) that is linked to the ship's broader management plan.

The Victorian Section of RINA would like to thank all of those who presented at these technical meetings throughout the year. They would also like to thank SKM Melbourne for providing the use of their offices for these technical meetings and presentations.

The presentations normally take place every second month on Thursday evenings at the offices of SKM on Flinders Street in the city. All are welcome to attend.

Karl Slater

New South Wales

Committee Meetings

The NSW Section Committee met on 23 September and, other than routine matters, discussed:

- SMIX Bash 2013: Sponsorships being pursued and registrations opened to members before non-members and friends.
- Technical Meeting program 2014: Proposals are in place for the RINA's four technical meetings, with authors to be confirmed for dates; five technical meetings to be arranged by IMarEST.
- Crewing RINA Stand at Pacific 2013 Exposition: Roster drawn up for crewing the RINA stand by members of the NSW Section Committee, with help from two visiting members.

The next meeting of the NSW Section Committee is scheduled for 18 November.

Energy Efficiency Design Index

Elliot Thompson of the Department of Defence gave a presentation on *Application of the IMO's Energy Efficiency Design Index to Royal Australian Navy Vessels* to a joint meeting with the IMarEST attended by twenty-nine on 4 September in the Harricks Auditorium at Engineers Australia, Chatswood.

Introduction

Elliot began his presentation by saying that he had undertaken his thesis project on this topic at UNSW the previous year. The topic had been proposed by Martin Grimm, Principal Naval Architect in the Directorate of Navy Platform Systems. While navies are not subject to IMO regulations, the Royal Australian Navy does try to be a good corporate citizen and to comply as far as possible. He (Elliot) is now working for the Stability Technology Department of the Directorate of Navy Platform Systems in Canberra.

The Global Problem of Emissions

Greenhouse gas emissions are contributing to global warming. These gasses are prolific in the industrialised world, and a large contributor of greenhouse gasses is internal combustion engines. Carbon dioxide (CO_2) is understood to be the main contributor. Many of these gas emissions can be reduced through new and innovative technologies.

The Shipping Industry Context

The commercial shipping industry's governing body and legislator is the International Maritime Organisation (IMO) and, in 2009, commissioned a report on greenhouse gas emissions from the shipping industry. This report showed that shipping accounts for 3.3% of global greenhouse gas emissions. IMO identified the potential for significant reductions in greenhouse gas emissions using currently available technologies, considering that reductions of 20–75% were possible.

The IMO Solution

IMO then went ahead and, under the auspices of the Marine Environment Protection Committee (MEPC), developed the Energy Efficiency Design Index (EEDI). The resulting amendments to MARPOL Annex VI, *Regulations for the Prevention of Air Pollution from Ships*, entered into force on 1 January 2013, and add a new Chapter 4 to Annex VI on *Regulations on Energy Efficiency for Ships* to make mandatory the EEDI for new ships, and the Ship Energy Efficiency Management Plan (SEEMP) for all ships. The EEDI assesses traditional-style ships with traditional propulsion and power-generation systems. Naval vessels are excluded from the EEDI

The Royal Australian Navy Context

The Department of Defence has its own *Environmental Strategic Plan 2010–14*, which aims at improvements in operations and training to benefit the environment. This project focussed on the priority area of Defence capability in acquisition, in-service and disposal and assists in achieving the goals of the Environmental Strategic Plan

The EEDI

The EEDI equation calculates the CO_2 produced as a function of a ship's transport work performed, i.e. the equation provides a measure of the ship's 'benefit to society' by establishing how much CO_2 is produced per unit of transport work done:

$$EEDI = \frac{CO_2\ emissions}{Transport\ Work}$$

This is usually expressed as grams of CO_2 per tonne per nautical mile for cargo vessels, or grams of CO_2 per passenger per nautical mile for passenger vessels. The EEDI is assessed against a baseline which uses vessel data taken from IHS Fairplay from January 1998 to December 2009. The data was grouped by vessel type, averaged for each type, and an exponential regression line established for each type. These baselines will be reduced periodically to keep pace with new technologies and efficiency targets.

The full EEDI equation is

$$\frac{\left(\prod_{j=1}^{M} f_j\right)\left(\sum_{i=1}^{nME} P_{ME(i)} \cdot C_{FME(i)} \cdot SFC_{ME(i)}\right) + \left(P_{AE} \cdot C_{FAE} \cdot SFC_{AE}*\right) + \left(\left(\prod_{j=1}^{M} f_j \cdot \sum_{i=1}^{nPTI} P_{PTI(i)} - \sum_{i=1}^{neff} f_{eff(i)} \cdot P_{AEeff(i)}\right) C_{FAE} \cdot SFC_{AE}\right) - \left(\sum_{i=1}^{neff} f_{eff(i)} \cdot P_{eff(i)} \cdot C_{FME} \cdot SFC_{ME}\right)}{f_i \cdot Capacity \cdot V_{ref} \cdot f_w}$$

This is not as fearsome as it first looks!

The first term in the numerator refers to the main engine(s), the second to the auxiliary engine(s), the third to energy-saving technologies (auxiliary power), and the final term to energy-saving technologies (main power). The energy-saving technology terms may include, for example, waste-heat recovery systems, the use of wind power or solar power. The CO_2 produced is based on the product of the power, specific fuel consumption and carbon factor for a particular type of fuel used.

The denominator of the equation relates the total CO_2 generated by the numerator to ship capacity and speed. In addition, there is a series of correction factors which moderate the equation. These account for

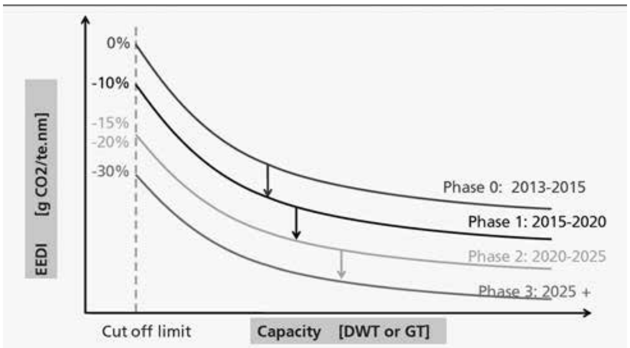
- ship design factors (e.g. ice-class and shuttle tankers);
- a weather factor for decrease in speed in representative conditions;
- voluntary structural enhancement;
- ships built to Common Structural Rules (CSR); and
- a capacity correction for chemical tankers and LNG ships.

The calculation of the EEDI is detailed within the 2012 *Guidelines on the Method of Calculation of the Attained EEDI for New Ships* (IMO Resolution MEPC.212(63).

Lower EEDI values mean greater efficiency. The equation is based only on equipment which produces CO_2 and no hull or hydrodynamic parameters are included directly. However, a more-efficient hull would require lower power, and result in a lower EEDI.

The calculation of the EEDI is simplified by a spreadsheet available from the Baltic and International Maritime Council (BIMCO) [*Free download from www.bimco.org; type eedi into the search box, and click on EEDI Calculator* — Ed.]

The EEDI value has limited relevance on its own, but provides a first-principles approach to CO_2 emissions. Many of the EEDI limitations and scope are due to currently-established baselines, and these will be periodically reduced to comply with environmental targets and legislation. Reductions are proposed for 2015, 2020 and 2025:



Proposed EEDI reductions
(Image from Lloyd's Register's *Implementing the Energy Efficiency Design Index*)

Responses to the EEDI

There has been both praise and criticism for the EEDI. Most marine experts believe that it is a step in the right direction, as it calculates the maximum CO_2 output (based on power available), and addresses CO_2 emissions at the source. However, it fails to consider CO_2 output based on *actual* power demands, assesses auxiliary power available rather than actual electrical demand, and there is no allowance for energy-saving measuress. There are loopholes to decrease EEDI without reducing CO_2 emissions.

EEDI in the RAN

The EEDI was applied to a range of Royal Australian Navy vessels:

HMAS *Success,* a compromise between a commercial vessel (tanker) and naval vessel (battlefield command-and-control vessel with helo operations).

HMAS *Choules*, a Bay-class landing ship, with a unique feature being the hybrid propulsion system.

MMAS *Sirius*, a double-hull tanker.

HMAS *Tobruk*, a unique ro-ro vessel providing helo operations and troop embarkation.

HMAS *Anzac,* a pure war-fighting vessel.

Data for these vessels was obtained from the Directorate of Navy Platform Systems and run through the BIMCO spreadsheet. Some interesting results were produced:

HMA Ship	EEDI (g/dwt-n.m.)	Power (kW)	Auxillary Power (kW)	Shaft Generators (kW)	Speed (knots)	Deadweight (tonnes)	Required EEDI (g/dwt-n.m.)	Compliance Index (%)	Status
Success	45.766	15 294	1 742	4 000	19.0	10 088	13.039	351.0	Non-compliant
Choules	37.426	6 700	4 000	-	18.0	6 002	16.003	233.9	Non-compliant
Sirius	7.166	8 560	1 820	-	16.5	36 553	10.000	71.7	Compliant
Tobruk	99.013	7 200	1 800	-	18.0	2 438	20.811	475.8	Non-compliant
Anzac	280.830	6 500	2 760	-	18.0	776	25.720	1091.9	Non-compliant

A compliance index of 0–100 meets the IMO requirement, while a compliance index of more than 100 does not.

Results indicate that most RAN vessels would not comply with the EEDI if built today. This is typically a result of high power (numerator) and low deadweight capacity (denominator). There is often high power demanded of the auxiliary engines to power naval-specific equipment (numerator), and low deadweight (denominator).

HMAS *Success*

This vessel attained an EEDI of 45.8, but would require a value of 13.0 if built for commercial use today. There is a number of reasons for this high value:

- her replenishment-at-sea equipment requires two 2000 kW shaft generators;
- commercial tankers do not require a crew of 200+ and so this vessel has less room for cargo than commercial tankers;
- she also provides non-tanker support;
- she has high speed and power relative to other tankers;
- naval-specific equipment has been included in the lightship, where it might be better included in the deadweight; and
- the age of the vessel and the associated technology onboard.

To gain some further insight, HMAS *Success* was compared to one of the Botany Bay tankers:

Vessel	EEDI (g/dwt-n.m.)	Power (kW)	Auxillary Power (kW)	Shaft Generators (kW)	Speed (knots)	Deadweight (tonnes)	Required EEDI (g/dwt-n.m.)	Compliance Index (%)	Status
HMAS *Success*	45.766	15 294	1 742	4 000	19.0	10 088	13.039	351.0	Non-compliant
Botany Bay Tanker	17.098	4 440	1 320	-	14.0	12306	11.663	146.6	Non-compliant

This shows that the high main engine power, shaft generator and high speed all negatively impact on *Success*' attained EEDI value, and indicate that the EEDI tanker baseline is not really suitable for assessing a vessel like HMAS *Success.*

HMAS *Choules*

This vessel attained an EEDI of 37.4, but would require a value of 16.0 if built for commercial use today. However, this result must be treated with caution, as IMO does not have sufficient baseline data for "hybrid propulsion vessels". There is a number of reasons for this high value:

- the baseline does not assess *Choules* adequately;
- she has the highest auxiliary power of all RAN vessels, due to the demand from the electrical systems;
- the duration of demand from auxiliary power; and

- personnel requirements and amphibious operations are not accounted for in the EEDI calculation.

HMAS *Sirius*

This vessel attained an EEDI of 7.2, and would require a value of 10.0 if built for commercial use today. She is the only RAN vessel to attain EEDI compliance! There is a number of reasons for attaining the required EEDI value:

- she has extremely high deadweight capacity;
- she has a slow speed of 16.5 knots, which is similar to commercial tanker standards;
- she has a single slow-speed diesel engine and, hence, high efficiency; and
- she was originally designed as a commercial tanker (2004) and then converted for naval use (2006) and so is the most-modern of the vessels investigated.

HMAS *Tobruk*

This vessel attained an EEDI of 99.0, but would require a value of 20.8 if built for commercial use today. There is a number of reasons for this high value:

- the ro-ro design is not currently assessed as a ship type by the EEDI;
- she has low deadweight capacity, due to the nature and type of cargo (typically low density vehicles and personnel); and
- the operational capacity of *Tobruk.*

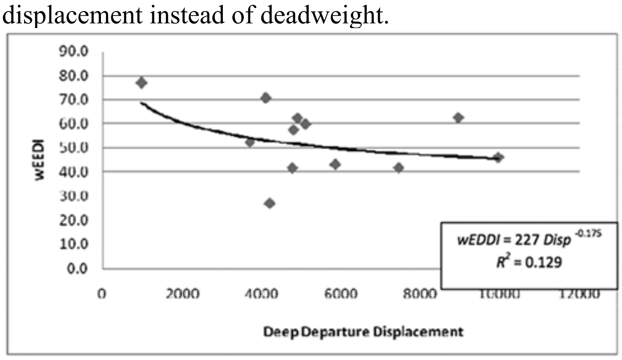
HMAS *Anzac*

This vessel attained an EEDI of 280.8, but would require a value of 25.7 if built for commercial use today. There is a number of reasons for this high value:

- she has extremely low deadweight capacity, which is not analysed under the EEDI framework;
- she is not required to carry cargo, other than the crew complement and armament; and
- The current calculation excludes Anzac's 22.5 MW GE LM2500 gas turbine and sprint speed of 27 kn.

Recent Developments

Bucknall, Wynard and Greig of University College, London, published a paper in 2012 in which they proposed an EEDI for warships, which they called the WEEDI (Warship EEDI). This proposal identified the current shortfalls and developed a baseline for a range of warships, using the deep departure displacement instead of deadweight.



Proposed WEEDI — EEDI for warships
(Image courtesy Elliot Thompson)

Their results show that the Anzac-class frigates, with a displacement of 3500 t and an EEDI of 52 meets the WEEDI requirement, while the Hobart-class destroyers, with a displacement of 6000 t and an EEDI of 43 easily meets the WEEDI requirement.

Conclusions

The current baseline does not take into account naval vessels and, in fact, naval vessels are not required to comply with the EEDI. Naval vessels which are based on commercial designs, e.g. HMAS *Sirius*, provide EEDI values which comply with the requirements. Despite the drawbacks, the EEDI compares similar vessels, so the errors and difficulties are factored into all cases. However, it is not reliable or accurate to compare most naval vessels to commercial vessels.

To apply the EEDI to naval vessels, there are two possibilities; a naval-specific baseline could be developed, or the EEDI could be modified to take into account naval-specific equipment and operations. There is obviously limited scope in comparing naval to commercial vessels. Baselines could be created for the following specific naval vessels: frigates, replenishment ships, patrol boats, minehunters, and transport ships. In either form, the EEDI can be an effective method in comparing two similar vessels — this can be useful in ship procurement when many similar options exist, and can be another element to add to the tender evaluation process.

Questions

Question time was length and elicited some further interesting points.

The EEDI is always compared to a baseline so, while it does not yet account for certain features, it can compare vessels of the same type.

The EEDI is calculated at the design stage, and is fully assessed from trials data following construction. What happens if the required EEDI value is not met? This is a statutory requirement for commercial vessels, and each flag state has its own benchmarks. If a vessel does not comply, then the EEDI certificate will not be issued (or can be withdrawn).

The Royal Australian Navy does not yet have in place a system for calculating and monitoring the EEDI values of all its vessels. However, it is being considered by the Directorate of Navy Platform Systems, in the interests of being a good corporate citizen.

Data in the EEDI calculation are not rated for tropic or non-tropic conditions. Much of the data is sourced from the manufacturer's test-bed conditions.

At present there is no incentive for the RAN (or any other navy) to retrofit their ships with more-efficient machinery. However, one aspect is reducing in-service costs, so there is an indirect incentive.

The EEDI value is based on power in the numerator, and does not consider hydrodynamic efficiency directly. However, a hydrodynamically-efficient hullform could be expected to require less power (in the numerator) to drive at a particular speed, and so would end up with a lower EEDI value.

The EEDI is a good for a ship operating on a fixed route, but looks like it would not be so good for a vessel on charter where the operational profile would be unknown.

The IMO has also come up with the Energy Efficiency Operational Index (EEOI) for vessels in operation, but this requires significantly more data to evaluate.

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

Elliot's presentation was recorded by Engineers Australia and is available as a webcast at www.mediavisionz.com/ea/2013/easyd/130904-easyd/index.htm.

James Cameron's *Deepsea Challenger*

Richard Stanning, Project Manager, gave a presentation on *James Cameron's* Deepsea Challenger — *the Buoyancy that Brought Him Back* to a joint meeting with the IMarEST attended by 48 on 2 October in the Harricks Auditorium at Engineers Australia, Chatswood. This was the second-highest attendance of the 68 meetings held since Engineers Australia moved to Chatswood in June 2006.

Introduction

Richard began his presentation by saying that *Deepsea Challenger* is a 7.3 m deep-diving submersible, designed to reach the bottom of the Challenger Deep in the Mariana Trench east of the Philippines and SW of Guam, the deepest known point on Earth. On 26 March 2012, Canadian film director James Cameron piloted the craft to reach the bottom of the Challenger Deep at a recorded depth of 10 898 m It was the fourth ever dive to the Challenger Deep, the second manned dive, the first solo dive and the first to spend a significant amount of time (three hours) exploring the bottom with scientific sampling equipment and high-definition 3-D cameras [*For many videos of the vessel and the voyage, search YouTube for* Deepsea Challenger — Ed.]

Bathyscaphe *Trieste*, fifty-three years earlier, was a completely different vessel, and carried two people to the bottom of the Challenger Deep, but spent only twenty minutes on the bottom, and one of the outer Plexiglas window panes cracked, shaking the entire vessel [*For more details of* Trieste*, see http://en.wikipedia.org/wiki/Bathyscaphe_Trieste* — Ed.]

Deepsea Challenger was built in Sydney by the research and design company, Acheron Project, and McConaghy Boats was a key contributor, having a wealth of experience and talented staff, and were responsible for the construction of the buoyancy beam for the vessel. Richard Stanning project managed the construction of the main structural beam which incorporated the syntactic foam buoyancy material, Isofloat®, created specially for the project by Australian engineer Ron Allum. This material is capable of withstanding the huge compressive forces at the 11 km depth. The new foam is unique in that it is more homogenous and possesses greater uniform strength than other commercially-available syntactic foams yet, with a relative density of 0.69, will float in water. The foam is composed of very small hollow glass spheres suspended in an epoxy resin.

James Cameron (L) and Richard Stanning
(Photo courtesy Richard Stanning)

Richard's involvement began when Ron Allum approached him with two pieces of white material, asking could he bond these together? The short answer was "yes" and, one-and-a-half years later, they ended up at the Australian International Design Awards with their solution.

Timeline

2004–05	James Cameron and Ron Allum discussed going really deep
2006–07	Pilot sphere
2009	Ron Allum and only two others full time
Jun 2010	Acheron asks for help
Dec 2010	Isofloat® sheet available for trial bonding
May 2011	Development trials
Jul 2011	Maximum Isofloat® block production and main structural beam commencement
Nov 2011	Main structural beam completion
Dec 2011	Submersible Assembly
Jan 2012	Sea Trials
26 Mar 2012	Record Dive on the Marina Trench

The Vessel

The vessel comprised four main attributes: a metal sphere for the pilot; ballast weights to make the vessel dive; buoyancy material to make it float; and a release mechanism for the weights to enable ascent. These aspects never changed from concept to the dive. They were perfected during the eight-year design-and-construction project. The pilot sphere is 1.1 m in diameter, large enough for only one occupant and has steel walls 64 mm thick. At the depth of 10 898 m (which is deeper than Mt Everest is high, and at three times the depth of *Titanic*), the pressure is 114 MPa. The sphere was tested for its ability to withstand this pressure in a chamber at Pennsylvania State University. The sphere sits at the base of the 11.8 t vehicle under the main structural (buoyancy) beam. The vehicle operates in a vertical attitude, and carries 500 kg of ballast which allows it to both sink to the bottom and, when released, rise to the surface. If the ballast release system fails, stranding the craft on the sea floor, a backup galvanic release is designed to corrode in salt water in a set period of time, allowing the sub to automatically surface. *Deepsea Challenger* is less than one-tenth the mass of *Trieste*, carries dramatically more scientific equipment, and is capable of more-rapid ascent and descent.

Construction and Testing

The buoyancy and structural beam construction and testing essentially ran in parallel as two distinct aspects within the buoyancy beam project scope. Testing started at the beginning and continued throughout the project. In the overall Acheron Project, every item of equipment needed to be pressure tested to beyond full ocean depth. However, there was one component which could not be tested, i.e. the main structural beam, because there was no facility large enough to take it! Testing continued all the time including, towards the end, fasteners in the sidewalls.

The Isofloat® syntactic foam material came in blocks which then had to be bonded and shaped as required. The system of testing the bonding of the blocks was critical. The project needed clear, uncompromised, evidence that the bonded material would not contract more than predicted under pressure, and that bonded blocks performed similarly, at full pressure, to the individual Isofloat® blocks.

Isofloat® blocks prior to bonding
(Photo courtesy Richard Stanning)

The construction method bonded small Isofloat® blocks into bigger blocks and these into large segments. Seven segments, some over a tonne in mass, were bonded together with millimetre accuracy to construct the main beam. The functions and systems of the submersible, once finalised, needed many holes and cavities in the main structural beam, so there were lots of 3D models and finite-element analysis, including a lift point for the vessel—but only one. Ron Allum spent five years developing the detail, and then the lift point was added! (*Note: launch and recovery aspects of expeditions are fraught with difficulties relating to weather and sea-state changes*: *thus the late-seeming change. It made for a better solution during the expedition phase. This, launch and recovery information, was not part of this actual presentation*.) One of the complex holes was the tunnel arrangement to take cabling from one part of the vessel to the other, and this was placed on the centreline. The main structural beam also needed an outer layer of sheathing to absorb knocks and abrasions.

Segment of main beam
(Photo courtesy Richard Stanning)

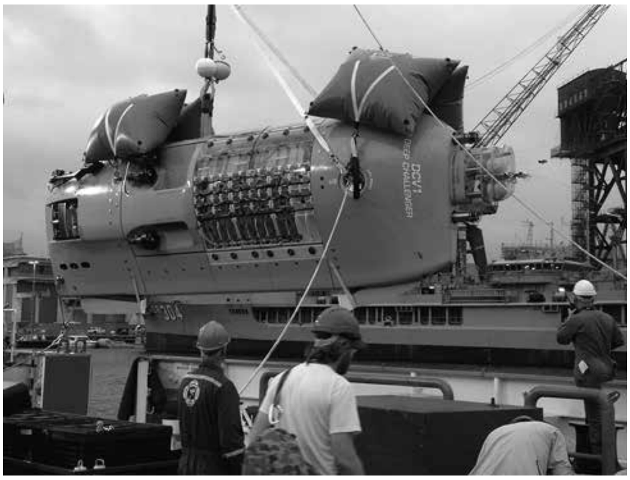
All seven segments bonded
(Photo courtesy Richard Stanning)

Some parts of the vessel were made in the USA and, while the outer laminates were being tested, Richard received feedback that the fibre-reinforced sheathing laminates on the main structural beam were the best quality that had been seen, and could they help with other parts? The team constructing the buoyancy and main structural beam carried on to construct the thruster blocks, light support structure and upper surface fairing.

The main structural beam was 5.8 m long and, at the depth of 10 898 m, shortened by 60 mm. The accurately-developed process steps instilled in and implemented by trained personnel did everything possible to ensure that there was no ingress of water into the material (*it was minimal: in all cases at 114 MPa, water gets in, even at decimals of a percent*). If it takes on water, then the mass increases. In general, the laminates dealt well with water ingress, and so they laid most of them up, this included sheathing for the thruster blocks, battery boxes, etc.

Buoyancy and main structural beam handover
(Photo courtesy Richard Stanning)

The first diving tests of the vessel were done off Garden Island in Sydney, where they tested the thrusters for moving horizontally. Further tests were done in Jervis Bay, NSW, followed by progressively deeper tests to 8212 m in the New Britain Trench off Rabaul, Papua–New Guinea, with the vessel being inspected closely after each dive. At the Challenger Deep, two dives to the bottom were made, one by pre-determined computer control unmanned, and then one with James Cameron.



Launching for initial trials in Sydney Harbour
(Photo courtesy Richard Stanning)

The People

Everyone who worked on the project has to be grateful to James Cameron, firstly for his vision and wanting to dive to the deepest point on Earth and, secondly, for unlocking the "funding" to get there.

The workforce at McConaghy Boats was up to 40 people in a coordinated, at times seven-days-per-week, program and working to ensure outcomes in a one-off project. This deepsea project was also demanding, just as other projects had been over the years. All the prior experience working and sustaining such a pace and delivering the objectives, can't be discounted from the final result.

Conclusion

The project was, ultimately, successful, as James Cameron got where he wanted to go, and set a number of deep-diving records along the way. It was the fourth ever dive to the Challenger Deep, the second manned dive there, the first solo dive there, and the first to spend a significant amount of time (three hours) exploring the bottom.

Questions

Question time was lengthy and elicited some further interesting points.

There are other commonly-available buoyancy materials, but (as current understanding has it) these do not behave the same on the inside as on the outside. The Isofloat® foam was developed as a multi-use material.

What is the next project? The Woods Hole Oceanographic Institution in Massachusetts has formed a partnership with James Cameron and he is donating his submersible *Deepsea Challenger* and associated technology to the research centre. WHOI is eminent in the field of deep-water ocean research, and they have gained a lot of information from the project. Ron Allum has moved on to develop further deepsea vehicles and other "things".

There may appear to be few commercial applications at those sorts of depths, although military applications are more certain to come. The pilot's sphere has its own environment. There are significant changes in temperature from 38°C at the surface to –4°C at the bottom, but this is handled OK, although condensation is an issue. Pressure inside the sphere is not an issue for the pilot.

The Isofloat® foam was developed specially for this project, and Ron Alum did the development work and obtained the patent for it, and makes it available for other applications. The ingredients come from different companies. The buoyancy foams available at the time could not do the job, and so Ron Allum developed the new foam for a multiple-dive vehicle.

The non-destructive inspection of the blocks was done by a company linked to a classification society.

What safety factors were used on the design? The margins were lower than typical standards may be comfortable with, and everything was re-calculated many times. Certain areas were pushing the limits on codes. For example, the hydrostatic crushing pressure on the Isofloat® foam was 152 MPa and so, with an external pressure of 114 MPa, there was not a big margin.

The portholes were interesting. They were initially designed as a frustum of a cone with the apex facing inwards. However, initial testing showed that they had a problem with stress concentration on the outer bearing surfaces. With the aid of finite-element analysis, Ron was able to change the shape of the bearing surfaces to convex outwards, and this cured the problem.

Descent took about 2.5 h, and ascent about 2 h [*For further details, see http://en.wikipedia.org/wiki/Deepsea_Challenger* — Ed.]

As this was the first vehicle to spend a significant amount of time (three hours) exploring the bottom,10.89 km below the sea surface, one also needs to note that the scientific community has been reported as saying; "Now *there is* ***never-had-before-****information, samples and data, that may well be reviewed and sifted through over the next, up to, 10 years.*"

When testing the unmanned dives, the dives were pre-programmed, including use of external pressure sensors, redundancy and timer response.

Micro explosives were used for the release of ballast weights to ensure the return of the vessel to the surface.

Different weights were used for different depths; 500 kg was used to go to the bottom, but 200/250/300/350 kg were used for various test depths. *Deepsea Challenger* does not have ballast tanks; she relied on the main structural (buoyancy) beam.

The 60 mm reduction in length of the vessel under bottom pressure was one issue needing the correct approach with the encasing laminate. The properties of the laminate and foam in compression need to be similar; once bonded under pressure, the laminate-to-syntactic bond interface performed well, including the process to produce it.

The vote of thanks was proposed, and the "thank you" bottle of wine presented, by Adrian Broadbent who said that there was, indeed, a project-management issue, in that final testing could only be validated on the dive to 11 km! The vote was carried with acclamation.

Richard Stanning — profile at http://au.linkedin.com/pub/richard-stanning/8/335/733/

For further information, contact Richard directly and send requests to: stanning.richard@gmail.com

For further details on Isofloat®, see www.ronallum.com and email deepseaservices@ronallum.com

Phil Helmore

Tasmania

Francisco — the World's Fastest Ship

The third RINA/IMarEST technical meeting for 2013 in Tasmania was held on 8 August. Tim Roberts gave a presentation on the world's fastest dual-fuelled high-speed ferry, *Francisco*. Tim is the R&D manager of Revolution Design, the designers of the ship. In Tim's words:

"Built at Incat's shipyard in Hobart, Tasmania, *Francisco* is the world's fastest ship. With a cargo of over 1000 passengers and 150 cars, the 99 m catamaran can travel at speeds of over 50 kn. *Francisco* is powered by two aircraft engine-based GE gas turbines driving a pair of water jets. The vessel was named *Francisco* in honour of Argentineanborn Pope Francis by its owner Buquebus Ferries."

With new engines and innovative fuel systems, this ship broke a lot of new ground for Incat and the fast-ferry industry. Achieving over 58 kn, it also broke previous Incat speed records. Interestingly, from a full-scale trials point of view, the ship increased her top speed by nearly 10 kn after cleaning and tuning. The enormous power was delivered primarily from GE gas turbine engines, driven at around 10 000 RPM by diesel or LNG fuel. She has so much power that, on the delivery voyage, they had to shut down one whole side of the ship to slow her down. The new fuel source opened up a classification minefield, through which Revolution Design had to navigate with the help of DNV.

Francisco is a truly remarkable development of the fast-ferry concept which Australian designers and builders have mastered over the years.

Engineering on Ice — What Lies Beneath

The fourth and final RINA/IMarEST technical meeting for 2013 in Tasmania was held on 3 October. Rowan Frost of AMC gave a presentation entitled *Engineering on Ice — What Lies Beneath*. In 2010 a small group of engineers studied the acoustic environment under Antarctic sea ice for the purpose of mapping the underside of the ice using an autonomous underwater vehicle (AUV). In 2012 as part of the second Sea Ice Physics and Ecosystems Experiment (SIPEX II) the Woods Hole Oceanographic Institution Seabed AUV was deployed under ice and multibeam data was collected at a number different locations, producing 3D surface topography. This information was fed back into mathematical models for predicting sea ice behaviour. Rowan's described his experiences and some of the science behind the second trip in 2012.

As every year goes by we seem to get more questions about the sea ice. In the last few years it appears that, whilst the Arctic is retreating, the Antarctic is actually expanding slightly. To understand this, teams of scientist are trying to model the macro changes to the Earth's climate. However the models are never very good and lack basic validation data. Projects such as SIPEX II aim to provide this data from the most hostile region of the world, the Antarctic. After months of expedition, this mission did provide some of the most-detailed under-ice measurements ever provided from the Antarctic. Along with a large number of fascinating photos and videos of wild life, ice-sculpture building and general life aboard, Rowan was able to explain some of the complexities of collecting data in this region.

The 2013 Season

On behalf of the Tasmanian Division of RINA I would like to take this opportunity to publicly thank all our speakers for 2013 and the IMarEST for their help in organising this year's talks. It has shown us a fascinating cross spectrum of the maritime industry, showing what incredible work can be achieved with a truly open mind and multi-disciplinary approach. From building the largest warships in the world, to building the invisible submarines of Australia; from the fastest ferry in the world, to using AUVs to map out the underside of sea ice. It has been a very interesting year of technical meetings.

Jonathan Binns

COMING EVENTS

NSW Section

The fourteenth SMIX (Sydney Marine Industry Christmas) Bash will be held on Thursday 5 December aboard the beautifully-restored *James Craig* alongside Wharf 7, Darling Harbour, from 1730 to 2230. This party for the whole marine industry is organised jointly by RINA (NSW Section) and IMarEST (Sydney Branch).

Tickets are available from Adrian Broadbent on (0419) 831 781 at $30 per head (cash or cheque payable to RINA NSW Section), but you will need to hurry as tickets usually sell out.

The model for the silent auction has, as usual, been built by Bill Bollard and is of the Sydney Heritage Fleet's vessel, *John Oxley*.

Victoria Section

The Victorian Section of RINA plans to hold a social event onboard the museum ship HMAS *Castlemaine* in Williamstown on 12 December which will be held jointly with IMarEST. Members of the Section will be provided with details by email.

Pacific 2016 IMC

The Pacific 2016 International Maritime Conference, organised by the Royal Institution of Naval Architects, the Institute of Marine Engineering, Science and Technology, and Engineers Australia, will be held, as usual, on 2–4 February 2016. However, due to re-construction of the Sydney Conference and Exhibition Centre at Darling Harbor, the venue will be at the Sydney Conference and Exhibition Centre at Glebe Island.

Initial details are on the website www.pacific2016.com.au.

HPYD Conferences

The premier conferences on developments in sailing technology are the High Performance Yacht Design Conference (New Zealand), the Innov'Sail Conference (France) and the Chesapeake Sailing Yacht Symposium (USA). The inevitable clash of dates has been avoided by the conference organisers agreeing on a rolling three-year cycle with one key conference each year. The dates are:

Innov'Sail	2013, 2014, 2017
CSYS	2014, 2016, 2019
HPYD	2015, 2018, 2021

Because both CSYS and Innov'Sail were held in 2013, there will be no HPYD conference in 2014. The next one will be held in 2015.

This agreement should smooth the organisation and make the conferences more enjoyable and of a higher quality for delegates. As a result, each conference will cross-promote the others.

DSTO/Thales Strategic Alliance

The Defence Science and Technology Organisation (DSTO) and Thales Australia have signed a strategic alliance to collaborate on a number of research programs aimed at strengthening Defence capability.

The new alliance focuses on research and development of armaments, underwater systems and land systems.

"Defence achieves a strategic technology advantage when DSTO capabilities are complemented by partnerships with industry," said Chief Defence Scientist, Dr Alex Zelinsky.

He said that DSTO and Thales had a long history of research collaboration which has led to better protection for Bushmaster vehicles, the development of innovative minesweeping systems, and next-generation fibre-optic towed arrays for tracking maritime vessels.

"We now have an opportunity to work more closely in new areas of capability which are of critical importance to Defence, such as the future submarine and land-fighting vehicle systems," Dr Zelinsky said.

Thales Australia CEO, Chris Jenkins, welcomed the alliance, saying that better results can be achieved when partnerships are structured for long-term strategic relationships rather than one-off projects.

"This alliance provides a framework which enables us to get involved early in DSTO's technology-development process, and is the foundation for a new wave of innovation aimed at delivering capability into the hands of the Australian Defence Force.

"A short-term opportunity is to progress the Fibre Laser Sensor, which we have developed with DSTO for a number of years. This is a breakthrough undersea sensing technology which could add significant capability to the future submarine force," Mr Jenkins said.

BMT Delivers Study for RAN

Melbourne-based BMT Design & Technology (BMT), a subsidiary of BMT Group Ltd, has completed a study for the Commonwealth of Australia which examined a range of options for the Life of Type Extension (LoTE) of a wide range of Defence maritime platforms. This included the entire surface fleet of the Royal Australian Navy, through to the LCM (landing craft mechanised) and LARC (lighter amphibious resupply cargo) vehicles of Army Marine.

Undertaking the study in two stages over the course of 12 months, BMT developed a risk-based approach to assess the viability of LoTE for 11 classes of ship. Unlike the approach taken by others, BMT recognised the importance of ensuring that the study was not limited solely to material/condition surveys and incorporated the Fundamental Inputs to Capability (FIC). This allowed the full cost of operating the fleet within the various LoTE scenarios to be identified.

As well as identifying the costing options, the study provided an understanding of any impact on achieving availability targets while satisfying safety, environmental and technical risk imperatives.

Peter Sanders, Principal Consultant at BMT Design & Technology, commented "Our intimate understanding of the defence engineering environment provided the customer with the confidence that we could deliver a comprehensive study which met their requirements. We were also able to draw upon the knowledge and expertise from our sister companies, BMT Isis and BMT Defence Services, both of which have extensive experience of working in the defence sector."

Major AWD Milestone Achieved

The main radar tower for the first of Australia's three air-warfare destroyers, *Hobart,* was successfully lifted into position at the end of September.

Minister for Defence, Senator David Johnston, confirmed that progress on *Hobart* was well advanced.

"The Aegis tower is a complex block on the AWD because of specific requirements to ensure accuracy in build and the effectiveness of the SPY radar's operation," Senator Johnston said.

Senator Johnston said the Aegis tower, constructed onsite at the ASC Shipyard at Techport, Adelaide, will house the four octagonal-shaped phased-array panels of the Aegis AN/SPY-1D (V) search radar.

The achievement comes on the back of the significant milestone of the United States Navy's recommendation that the Aegis weapon system computer programs are ready for the on-board trial and activation of the combat system.

"The Aegis weapon system is the nerve-centre of the destroyers and integrates a number of sensors and effectors to simultaneously detect, track and engage multiple air, surface and subsurface targets," Senator Johnston said.

"The multi-function SPY radar is the main sensor for Aegis. The array faces send out beams of electromagnetic energy in all directions, providing a simultaneous and continuous search-and-tracking capability for hundreds of targets, providing the Royal Australian Navy with one of the most advanced warships in the world."

The acceptance of the Aegis computer programs by the US Navy follows extensive testing last year by developer Lockheed Martin and the US Navy, with involvement of the Defence Materiel Organisation and Royal Australian Navy.

Speaking at the Pacific 2013 International Maritime Conference, the CEO of the AWD Alliance, Rod Equid, explained just how much progress had been made with the construction of *Hobart*.

"Hull consolidation for the first of three AWDs is nearly complete with just seven remaining blocks out of 31 to be joined to the ship's structure," he said.

"We are delighted with the progress of *Hobart* over the past 12 months. All sub-contracted blocks constructed by BAE Systems, Forgacs Engineering and Navantia for the ship have arrived at the ASC Shipyard in Adelaide and the warehouses are full of equipment in readiness for load out."

Rod Equid said that more significant AWD achievements would be made in the coming months.

"We expect the last block for *Hobart* to be lifted into place at the end of this year and that block join fully welded early in 2014," he said.

"The ship will then be launched in the second half of 2014 and the combat system should be activated by the end of next year."

The first RAN air-warfare destroyer, *Hobart*, following the erection of the Aegis tower
(DMO photograph)

"Considerable internal fitout activities will also continue, including installing the water coolers, diesel generators, main engines, gearboxes and equipment to support the combat system."

Reflecting on the AWD project's other achievements, Rod Equid said that it is important to consider the significant contribution which it has made to national shipbuilding.

"The project is currently operating at its peak workforce and the attraction, assembly and training of our teams has been one of the great success stories of the AWD project," he said.

"Together with efforts to support the parallel Landing Helicopter Dock project, we have re-established the relatively dormant naval shipbuilding industrial capability in Australia," he said.

Submarine Technology Challenge Pilot

On 15 October the Minister for Defence, Senator David Johnston, announced that the Defence Materiel Organisation (DMO) will sponsor Re-Engineering Australia to undertake a pilot 'Future Submarine Technology Challenge' in selected Australian schools next year.

The school-based challenge will draw on the success of the 'F1 in Schools Challenge', also run by Re-Engineering Australia and sponsored by the DMO.

"A career in a high-end discipline like systems design or engineering starts well before your first day on the job," Senator Johnston said.

"It starts with the subjects and electives you choose in school and the tertiary qualifications that you aspire to gain.

"Initiatives like the F1 in Schools Challenge and this new pilot program focussed on submarines are all about encouraging our school students to be pursuing interests in the science, technology, engineering and mathematics disciplines."

The Future Submarine Technology Challenge will give participating students hands-on experience with core submarine project elements including:

- Project management: establishing an organisation (a virtual company) to complete the design project, assembling a team, managing the manufacturing process and presenting/marketing the final product.
- Design and manufacture: producing a scale model of a submarine hull, a scale model of one of the operational spaces within a submarine used for human habitation and producing virtual 3D models.
- Science and engineering: studying the impact of hydrodynamics and other forces on the design, testing energy generation, storage and usage methods.

The Subs in Schools pilot program will involve five schools in two States, with a balance of city and regional schools involved.

The DMO's sponsorship of Re-Engineering Australia aims to continue raising students' awareness of career opportunities in defence industry.

Sea Ceptor Air-defence System Selected for RNZN's Anzac-class Frigate Upgrade

The New Zealand MoD has confirmed its preferred tenderers for the Royal New Zealand Navy's (RNZN) Anzac Frigate Systems Upgrade project to include MBDA as the provider of Sea Ceptor for the Local Area Air Defence (LAAD) system, subject to the New Zealand Government's final approval to proceed. Sea Ceptor will equip frigates HMNZS *Te Kaha* and *Te Mana* with the latest-generation naval air-defence system capable of protecting not only the host ship but also combined joint allied forces in the vicinity.

Following a meeting in Wellington on 4 October 2013, Des Ashton, the NZ MoD Deputy Secretary of Defence (Acquisition), said "The primary objective of the Anzac Frigate Systems Upgrade project is to restore the ship's combat capability and utility to a comparative level to that of a current-generation, new-release combat system. This is required to counter the combined challenges of an increased level of threat sophistication, coupled with obsolescence of some of the current systems. We also want to leverage off advances in technology over the past 20 years and incorporate additional functionality and performance through the selection of modern combat-system elements. The LAAD Sea Ceptor system is a key component of the overall project, ensuring that crucial constituents of the RNZN fleet are best equipped to respond to the emerging threats and protect not only the frigates themselves but also high-value units in company."

Commenting on the New Zealand selection of Sea Ceptor, Dr Andrew Murrison MP, UK Minister for International Security Strategy, said: "The UK Government is pleased that the New Zealand Ministry of Defence is pursuing the procurement of Sea Ceptor, the same system that the Royal Navy has procured for their Type 23s and plans to cross deck onto the Type 26 Global Combat Ship. The UK is immensely proud of this product — it is a real example of UK innovation and will form the bedrock of air defence for the Royal Navy for decades to come. This decision by New Zealand further demonstrates the strengthening of our maritime security cooperation."

Steve Wadey, Managing Director MBDA UK, said "I am delighted that New Zealand has selected Sea Ceptor. The NZ Government's procurement of Sea Ceptor for the Anzac FSU project will be the first export success for this highly-capable weapon system and proof that MBDA is able to meet such challenging requirements. This success has been supported by the UK Government during discussions with the New Zealand Ministry of Defence, a cooperation which will continue through the life of the project."

The appeal of Sea Ceptor is creating significant interest in a number of markets around the world and its versatility makes it the ideal choice for the Anzac upgrade. As an active radar system, Sea Ceptor does not require the dedicated tracker/illuminator radars on which semi-active systems depend. Sea Ceptor deploys the CAMM (Common Anti-air Modular Missile) which, due to its soft-launch technology, requires no efflux management system. This minimises the system's mass and footprint, thereby allowing for greater flexibility regarding ship installation positions. CAMM missile canisters are compatible with a wide range of vertical-launch systems.

On 9 September 2013, the Royal Navy contracted with MBDA for the manufacture of the Sea Ceptor system for its frigate fleet. The UK will replace the Seawolf missile system in their Type 23 frigates with Sea Ceptor before migrating it to their new-build Type 26 frigates.

BMT Supports Rizzo Review

BMT Design & Technology has also recently completed a risk-management study for the Australian Government's Rizzo Reform Program which involves a plan to reform support-ship repair and management practices within Navy and the Defence Materiel Organisation (DMO).

As a joint Navy and DMO initiative, the Rizzo Reform Program has an active project team to reform risk management. The project team was formed to understand, investigate and evolve risk-management practices across all functions to achieve an Integrated Risk Management framework. BMT was contracted to advance the understanding of current practices in the raising, documenting, processing, managing and reporting of risks across all business units.

The risk domains included mission risk and risks to operational effectiveness, safety and environment, logistics and supply chain, training and personnel force and materiel condition management. The study investigated official and unofficial software and data systems supporting these functions, while also providing assessment and mapping of the way in which risks were understood and reported within and between business units and the various levels of management in Navy and DMO.

Chris Luxmoore, Senior Engineer at BMT Design & Technology, commented "As part of this process it was important for us to engage with stakeholders in Navy and DMO, providing us with valuable knowledge of simple, as well as complex, issues that people are facing in their daily work. Best practices were analysed and were duly considered with regard to the policy and required systems development. The study provided a snapshot of the risk-management framework across the organisation, enabling the DMO to focus their attention on particular areas which require improvement and to see how these improvements might interact across the business."

An overall matrix presented all of the relevant tools and software currently in use, and their effectiveness for use in risk management. A high-level process map illustrated the interaction of these tools and systems across Navy and DMO, and the risk-escalation process through levels of management. Both tools provided a benchmark understanding from which calculated decisions could be made to support the effective integration of risk-management systems across the different organisations.

ASMD Success

The Royal Australian Navy and the Defence Materiel Organisation (DMO) have recently completed the final operational acceptance trial for the Australian-designed phased-array radar and combat-management system upgrades to the Anzac-class frigate Anti-Ship Missile Defence (ASMD) system.

The trial included a number of successful Evolved Sea Sparrow Missile (ESSM) firings from HMAS *Perth* at the Pacific Missile Range Facility (PMRF) in Hawaii. During the trials, the ASMD system was challenged by a number of demanding firing scenarios. These included successful missile engagements against multiple sea-skimming targets including, for the first time in the RAN, an engagement by an ESSM against one of the world's most advanced supersonic targets.

Perth's Commanding Officer, CAPT Lee Goddard, said that the firing clearly demonstrated the effectiveness of the upgraded ASMD system.

"The targets were detected by the Australian-designed and built CEA phased-array radar and the missiles were successfully launched and controlled in flight by the ship's ASMD systems, resulting in the destruction of the targets," CAPT Goddard said.

"This proves the accuracy and precision of the upgraded systems to guide the weapon in a complex warfighting scenario."

Perth is the first of eight Anzac frigates to complete the ASMD upgrade to improve her weapons systems and sensor arrays.

The Chief of Navy, Vice Admiral Ray Griggs, said "The ASMD upgrade provides the Anzac class with a significantly-enhanced level of self and local-area defence against modern anti-ship missiles. The complexity of the firing scenarios is unsurpassed in the RAN's history,

HMAS *Perth* (157) during the International Fleet Review on 5 October 2013
(Photo John Jeremy)

particularly the successful firings against supersonic targets. The results from this activity are a ringing endorsement of the capability flowing from the ASMD program."

The RAN and DMO acknowledge that the success of the program has largely been due to the outstanding efforts and collaboration by the Navy, the DMO, Canberra-based CEA Technologies, SAAB Systems and the Defence Science and Technology Organisation.

An Evolved Sea Sparrow Missile (ESSM) being fired from HMAS *Perth* at the Pacific Missile Range Facility in Hawaii as part of the final operational acceptance trial for the Australian-designed phased-array radar and combat-management system upgrades to the Anzac-class frigate anti-ship missile defence system
(RAN Photograph)

Argentine President Names *Francisco*

On 1 October, in Buenos Aires, the President of Argentina, Christina Fernandez de Kirchner, became the "Godmother" to a vessel built in Australia.

Named *Francisco* in honour of the Argentine-born Pope, the 99 m world's fastest ship and the first large dual-fuel high-speed ro-ro vessel to use LNG as its primary fuel, was built in Hobart by Incat Tasmania and was delivered recently to South American company Buquebus.

The Argentinian President was joined by the President of Uruguay, Jose Mujica, at the glittering ceremony in Buenos Aires, with both presidents jointly cutting the ribbon at around 8 pm in front of 1500 invited VIP guests.

Francisco commenced service the following day on the River Plate (Rio de la Plata) between Buenos Aires and Montevideo.

Cantabria Sails for Home

After nine months operating as part of the Royal Australian Navy Fleet, the Spanish Armada ship, ESPS *Cantabria* sailed for home from her temporary homeport of Garden Island, Sydney, on 1 November.

Chief of Navy, VADM Ray Griggs AO CSC RAN, joined the Spanish Ambassador to Australia, HE Mr Enrique Viguera, Commander Australian Fleet, RADM Tim Barrett AM CSC RAN, and the Consul-General of Spain, Alvaro Iranzo Gutierrez, on the wharf to acknowledge the bonds which have developed between the nations.

"Today marks the conclusion of a very successful deployment. *Cantabria* integrated very effectively into the Royal Australian Navy Fleet and completed everything asked of her with great flexibility and efficiency," said VADM Griggs.

"The ship provided the RAN with underway replenishment capability conducting over 58 replenishments, and a chance for over 234 Navy personnel to familiarise themselves with some of the systems which we are about to acquire in our new Canberra-class landing helicopter dock ships and the Hobart-class air-warfare destroyers."

"The ground-breaking initiative is testament to the spirit of cooperation and collaboration which exists between the Spanish Armada and the Royal Australian Navy, and is a good example of 'Smart Defence'," said VADM Griggs.

Commander Nieto said that his crew will take home many memories from the deployment.

Cantabria sails from Sydney on 1 November accompanied by HMAS *Success*
(RAN photograph)

"The highlight for my crew would be sailing into Sydney Harbour as part of the RAN International Fleet Review 2013. Our participation in international exercises Talisman Saber13 and Triton Centenary also provided us with important training opportunities," said Commander Nieto.

"We were also able to trial *Cantabria's* full range of capabilities, including the operating maintenance cycle of ship systems, and ship logistics and maintenance support."

The modern combat logistic support ship also consorted the workup of Australian and New Zealand warships preparing for operational deployment and conducted a first-of-class flight trial for the MRH-90 helicopter to validate ship operating limits for the aircraft.

"While it is sad to say goodbye, my crew is looking forward to the return journey, which will see us visits ports in Indonesia, India and Turkey before arriving home just in time for Christmas," said Commander Nieto.

First Australian HAT for NUSHIP *Canberra*

The Defence Material Organisation (DMO) has successfully completed a vehicle load trial on NUSHIP *Canberra* in the first Landing Helicopter Dock (LHD) Harbour Acceptance Trial (HAT) to be done in Australia.

The ship moved from BAE Systems at Williamstown in Victoria, across the bay to Webb Dock to undertake the vehicle load trial during which Army vehicles were driven onto the ship and manoeuvred within the vehicle decks of the ship. It was a "cold move" meaning that the ship was moved across the bay with tugs and not under her own propulsion.

The Army provided several vehicles which will be used on the LHDs including a tank, an armoured personnel carrier and light vehicles.

The vehicles gained access to *Canberra* via the side ramps, drove around the internal heavy-cargo deck, down the "beach" and through the dock well of the ship. Those vehicles which required access to the light-vehicle deck utilised the internal ramp and elevator to move up decks to conduct trials there.

The trials were conducted on schedule and involved extensive planning, preparation and coordination between DMO, BAE Systems, the Navy and the Army.

DMO Project Trial Director, Lieutenant Colonel West, said that planning and coordination was the key to success.

"Planning for, and execution of, this trial event was meticulous, and the successful outcome was a product of the exceptional coordination between Ship Staff, DMO, Army, BAE Systems and the ship designer, Navantia," said Lieutenant Colonel West.

"The coming months will see the conduct of critical harbour and sea trials in preparation for the delivery of the ship to Defence," he said.

NUSHIP *Canberra*'s Engineer Officer, Commander David Walter, said that both the "cold move" and the vehicle load trial gave *Canberra* personnel a good learning opportunity.

"A range of *Canberra* personnel, including personnel from the amphibious, executive and engineering departments, observed both the 'cold move' and the vehicle load trial which was excellent training value in terms of becoming familiar with the ship in a real-time activity.

"There was significant training value in *Canberra* personnel being involved in terms of gaining confidence and seeing how parts of the ship work, including the operation of the ship's auxiliary and electrical systems, operation of side ramp doors, movement of lines to get the ship off and alongside the wharf, and the movement of vehicles inside the ship," said Commander Walter.

The ship will to be taken to sea later this year as scheduled for the commencement of Sea Acceptance Tests.

Commanding Officer designate of *Canberra*, CAPT Jonathan Sadleir, said that the tempo is increasing as the project milestones move closer to the time when Navy receives *Canberra* into service.

"We have over 300 ship's company who have now joined the ship and are undertaking a variety of training and preparedness activities ready to embark and operate the ship next year," said Captain Sadleir.

"As these milestones are achieved, it certainly becomes more exciting for our personnel as we step closer to bringing this new capability into the Fleet," he said.

Initial Materiel Readiness is when the ship is formally handed from the Project Manager (DMO) to Navy and is

HMS *Daring*, on her way to Sydney for the International Fleet Review, alongside NUSHIP *Canberra* at Williamstown (RAN photograph)

within schedule tolerance to occur in the first quarter of next year. From that moment on, Navy will become responsible for the safety, security and operation of the ship.

Canberra will have a complement of 360 personnel from Navy, Army and Air Force. She will be the first of two LHDs to be introduced into service with NUSHIP *Adelaide* scheduled to commission in 2015.

Upgraded Berth in Townsville

On 18 October the Minister for Defence, Senator David Johnston, attended the opening of the Quayside Terminal and Wharf 10 at the Port of Townsville with the Chief of Navy Vice Admiral Ray Griggs.

The opening of the $85 million facility, designed to expand existing Defence capabilities and the growing cruise-ship market, was officiated by the Governor of Queensland, Her Excellency Ms Penelope Wensley AC.

Senator Johnston said that Defence had contributed $30 million towards an upgrade and extension of Wharf 10 in cooperation with the Queensland Government, the Townsville City Council and the Port of Townsville.

"The upgrade will enhance the capability to support Navy's Landing Helicopter Dock (LHD) vessel and the capacity to provide access for other visiting RAN and foreign warships.

"This marks an important milestone for Defence in achieving an amphibious capability for our new LHDs and for the local economy in Townsville."

Defence contributed an additional $5.3 million to lease and develop an area within the Townsville port precinct for vehicles, equipment and personnel in support of operations.

The Minister and other dignitaries were able to inspect ships and static displays from the 3rd Brigade and HMA Ships *Leeuwin*, *Broome*, *Benalla* and *Shepparton* as well as an MRH 90 Helicopter from the 5th Aviation Regiment.

A Mack Heavy Recovery Vehicle embarks via the forward side ramp door of NUSHIP *Canberra*
(Photo courtesy BAE Systems)

The new Townsville Wharf 10 before its official opening
(Department of Defence photo)

LCS *Coronado* Completed

Built by Austal USA, the Independence-variant littoral combat ship *Coronado* (LCS 4) successfully completed acceptance trials on 23 August 2013 in the Gulf of Mexico. These trials included comprehensive tests by the US Navy while underway which demonstrated the successful operation of the ship's major systems and equipment.

Upon returning from trials, Craig Perciavalle, President of Austal USA, remarked "The successful completion of acceptance trials for this vessel validates the quality and reliability of Austal's shipbuilding know-how. I am pleased with the performance of this ship which is a direct result of the hard work and incredible craftsmanship of the entire Austal USA team of shipbuilding professionals."

Coronado was delivered to the US Navy on 27 September 2013.

The littoral combat ship (LCS) is a fast, agile, focussed-mission platform designed for operation in near-shore environments, yet capable of open-ocean operation. This vessel is the second of twelve, 127 m Independence-variant LCSs which Austal has been contracted to build for the US Navy (including USS *Independence* (LCS 2), delivered to the US Navy in 2009). The final 10 of the 12 were awarded

USS *Coronado* (LCS4)
(US Navy photograph)

to Austal as prime contractor in a $US3.5 billion block buy in 2010.

Austal's team partner, General Dynamics Advanced Information Systems (a business unit of General Dynamics), is the ship systems integrator, responsible for the design, integration and testing of the navigation systems, C4I, and aviation systems. The ships' highly-flexible open-architecture computing infrastructure (OPEN CI), designed, developed, and integrated by General Dynamics Advanced Information Systems, allows "plug and play" integration of both the core systems and the LCS mission modules. It is designed to the Navy's open-architecture requirements, strictly adheres to published industry standards, and facilitates the integration of commercially-available products.

"Our open-architecture computing infrastructure seamlessly integrates the ship's combat management and seaframe control system with other critical systems giving the crew the flexibility to access any system anywhere on the ship," said Mike Tweed-Kent, Vice President and General Manager of the Mission Integration Systems division at General Dynamics Advanced Information Systems. "This design allows the Navy to quickly and easily add new or upgrade existing capabilities to enhance the fleet's overall operational effectiveness."

The LCS program is in full swing at Austal USA with five ships under construction. *Coronado* (LCS 4) will soon be followed by *Jackson* (LCS 6) which will be launched at the end of this year and *Montgomery* (LCS 8), which is being assembled after keel laying on 25 June. Construction is also well underway on *Gabrielle Giffords* (LCS 10) along with *Omaha* (LCS 12) which started construction recently.

Unique US Navy Warship Launched

General Dynamics Bath Iron Works successfully launched the US Navy's first Zumwalt-class destroyer on 28 October at their Bath, Maine, shipyard.

The future USS *Zumwalt* (DDG 1000) will be the lead ship of the US Navy's newest destroyer class, designed for littoral operations and land attack.

The ship began its translation from Bath Iron Works' land-level construction facility to a floating dry dock on Friday 25 October. Once loaded into the dry dock, the dock was flooded and the ship was removed from its specially designed cradle. By late Monday, the dock had been flooded and the ship was floated off and secured to a pier on the Kennebec River.

"This is the largest ship Bath Iron Works has ever constructed and the Navy's largest destroyer. The launch was unprecedented in both its size and complexity," said CAPT Jim Downey, the Zumwalt-class Program Manager for the US Navy's Program Executive Office, Ships. "Due to meticulous planning and execution, the operation went very smoothly. I'm extremely pleased with the results and applaud the combined efforts of the Navy-industry team."

Construction began on DDG 1000 in February 2009, and the Navy and its industry partners have worked to mature the ship's design and ready their industrial facilities to build this advanced surface combatant. *Zumwalt* is currently more than 87% complete and the shipbuilder will continue remaining construction work on the hull prior to planned delivery late next year.

Because of the complexity of the first-of-class ship, the US Navy will perform a two-phase delivery process. Bath Iron

USS *Zumwalt* afloat after her launching at Bath, Maine
(US Navy photograph)

USS *Zumwalt* during the launching process
(US Navy photograph)

Works will deliver the ship itself to the US Navy in late 2014. Upon delivery, the USN will then conduct combat systems activation, tests and trials which will include multiple underway periods. The ship is expected to reach its initial operating capability in 2016.

The ship, the first of three Zumwalt-class destroyers, is intended to provide independent forward presence and deterrence, to support special operations forces and to operate as part of joint and combined expeditionary forces. The US Navy has incorporated many new technologies into the ship's unique tumblehome hull, including an all-electric integrated power system and an advanced gun system, designed to fire rocket-powered, precision projectiles up to 63 n miles.

The shape of the superstructure and the arrangement of its antennas significantly reduce the ship's radar cross section, making the ship less visible to enemy radar at sea. The design also allows for optimal manning with a standard crew size of 130 and an aviation detachment of 28, thereby decreasing life-cycle operations and support costs.

The lead ship and the class are named in honour of the former Chief of Naval Operations ADM Elmo R. 'Bud' Zumwalt Jr., who served as CNO from 1970–74.

Government Funding for Historic Ship Hull Transfer

On 17 October the Australian Government confirmed that it will provide up to $850 000 (GST exclusive) towards the transfer to Australia of the hull of historic vessel *City of Adelaide*.

The decision to provide the funding follows serious consideration of the previous Government's contractual commitment and will cover unpaid invoiced costs related to transporting the clipper ship's hull from the UK to Adelaide.

The grant is being funded from unallocated money within the $4.42 million Protecting National Historic Sites programme.

The Australian Government's offer of funding is subject to Clipper Ship "City of Adelaide" Limited's acceptance that the Australian Government will not provide any further funding to either the Clipper Ship "City of Adelaide" Limited or the historic vessel *City of Adelaide,* and that neither will further funding be sought.

"*City of Adelaide* is part of our history and is of significance particularly to the many South Australians whose heritage includes family members first reaching our shores on her," Parliamentary Secretary to the Minister for the Environment, Simon Birmingham, said.

"Many South Australians have worked for a long period of time towards bringing the *City of Adelaide* from Scotland to a new home here and we wish them every success in preserving this historic vessel for South Australians and others into the future." [*For further details, see also p. 54* — Ed.]

Spirit of Queenstown from Incat Crowther

Incat Crowther has announced the launch of *Spirit of Queenstown*. Built by Aluminium Marine in Queensland for Southern Discoveries of New Zealand's South Island, the 26 m catamaran *Spirit of Queenstown* will operate on Queenstown's Lake Wakatipu. Delivery to Queenstown involved removal of the vessel's wheelhouse for transport overland by truck to the lake.

Incat Crowther was awarded the design contract on the basis of its ability to work within the tight parameters of the New Zealand government's environmental regulations, contributing innovative thinking to develop a versatile and capable vessel, with a focus on low capital and operational costs.

The vessel's aesthetic was developed to integrate into Queenstown's foreshore environment without compromising the vessel's functionality or performance.

Spirit of Queenstown is an efficient vessel which balances low fuel burn and passenger comfort. Due to the remote nature of the operation, specific attention was given to the development of durable systems, with a robust structure, conservative engine ratings, and good machinery serviceability.

The vessel features 170 seats, 127 being inside the main-deck passenger cabin. A kiosk provides concession service aft. The outboard seats are arranged in booths with tables. Large double doors provide access to the cabin from the aft boarding gates. The aft main deck features three toilets and overhead hangers for bicycles. The upper deck features the wheelhouse and 43 exterior seats.

Spirit of Queenstown is powered by a pair of Yanmar 6HYM-WET main engines, each rated at 478 kW. Propulsion is via fixed-pitch propellers. The vessel has a top speed in excess of 27 knots.

Principal particulars of *Spirit of Queenstown* are

Length OA		27.3 m
Length WL		25.7 m
Beam OA		8.00 m
Depth		2.50 m
Draft	(hull)	1.20 m
	(propellers)	1.80 m
Passengers		170
Crew		4
Fuel oil		4800 L
Fresh water		500 L
Sullage		500 L
Main engines		2×Yanmar 6HYM-WET each 478 kW @ 2100 rpm
Propulsion		2× fixed-pitch propellers
Generators		2×Mase IS34T 33.7 kVA
Speed	(service)	23 kn
	(maximum)	27 kn
Construction		Marine-grade aluminium
Flag		New Zealand
Class/Survey		Maritime New Zealand Part 40 A Enclosed Waters

Spirit of Queenstown on trials
(Photo courtesy Incat Crowther)

Port bow of *Spirit of Queenstown*
(Photo courtesy Incat Crowther)

34 m Catamaran Passenger Ferry from Incat Crowther

Incat Crowther has announced a contract to design a 34 m catamaran passenger ferry for Fullers Group, the operator of the Auckland ferry network. The vessel, under construction by New Zealand builder Q-West, is the result of a thorough review of the network requirements, in which Incat Crowther worked closely with Fullers to develop a vessel which is optimised to suit the network requirements and existing infrastructure and offers operational flexibility.

The vessel's 338 passengers will be accommodated over two decks, in a mix of indoor and outdoor spaces. The main deck seats 212 passengers in the main cabin. There is a kiosk at the rear of the cabin, between a pair of large doorways designed to facilitate fast boarding and egress. Luggage racks are fitted adjacent to the entry doors. Lift-up seats and a curtain to port provide for a sick bay. A wide set of stairs leads to the upper deck, where 82 passengers are seated on an open deck protected by a fabric awning. Further kiosk facilities and a pair of additional WCs are forward of this, as well as a passenger cabin seating 44 passengers. Additional capacity exists for 50 standing passengers.

At the forward end of the upper deck is an asymmetric wheelhouse. The frequently-used starboard wing control station is enclosed, whilst the port side is dedicated to crew access via stairs to the foredeck. The foredeck is configured to carry palletised cargo, with a Palfinger deck crane. Bicycle racks are fitted to the main deck aft.

Passenger boarding is enhanced by the fitting of large side gates on both deck levels, as well as hinging articulated ramps mounted on the transom port and starboard. These ramps are designed to integrate with the existing shore-based infrastructure, and offer a fast turnaround time.

The vessel will be powered by a pair of Cummins QSK 38 main engines, each producing 1044 kW at 1800 rpm. The vessel will be fitted with dry exhaust systems which, along with the engine room air outlets, will exit high above the upper deck. This will reduce fumes and noise in passenger areas, and is typical of vessels in the Fullers fleet.

Manoeuvrability will be aided by a bow thruster in the port hull.

Incat Crowther is pleased to be associated with Fullers Group in the development of a new vessel for their diverse ferry network.

Principal particulars of the new vessel are

Length OA		34.0 m
Length WL		33.8 m
Beam OA		9.50 m
Depth		3.05 m
Draft	(hull)	1.25 m
	(propellers)	1.90 m
Depth		3.05 m
Passengers		50 + 338
Crew		3
Fuel oil		8000 L
Fresh water		3000 L
Sullage		3000 L
Main engines		2×Cummins QSK 38 M each 1044 kW @ 1800 rpm
Propulsion		2×fixed-pitch propellers
Generators		2×Cummins 6B-CP 100 kVA
Speed	(service)	26 kn
	(maximum)	30 kn
Construction		Marine-grade aluminium
Flag		New Zealand
Class/Survey		Maritime New Zealand

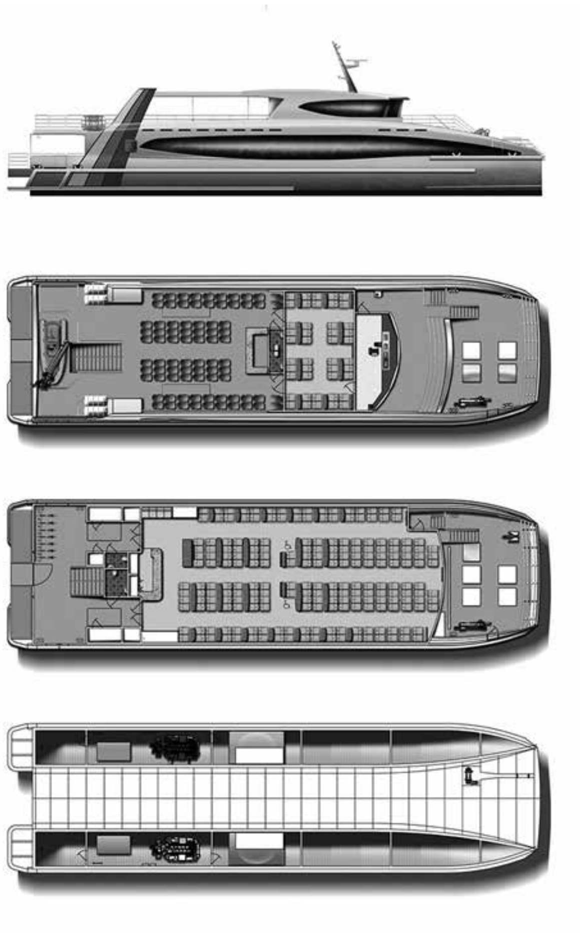
Provincetown IV from Incat Crowther

Incat Crowther has announced the launch and delivery of the 30 m catamaran passenger ferry *Provincetown IV* to Bay State Cruise Company of Boston, Massachusetts.

Gladding Hearn Shipbuilding of Massachusetts delivered the earlier vessel *Provincetown III* in 2004, and she has been operating successfully for nearly a decade. When the operator planned an expansion in services, so pleased were they with *Provincetown III* that *Provincetown IV* was developed based on the original design with an updated propulsion package for improved performance and efficiency.

The 149-passenger ferry features 108 interior seats on the main deck, along with a large bar and toilet facilities. Bicycle racks are fitted on the foredeck. Additional boarding gates are fitted to the aft upper deck, to integrate with the operator's shore-based infrastructure. 83 exterior seats are fitted to the upper deck. Large luggage racks are fitted on both decks.

As with *Provincetown III*, *Provincetown IV* features an isolated superstructure which improves passenger comfort by reducing the transmission of noise and vibration to the passenger cabin.



General arrangement of 34 m catamaran passenger ferry
(Drawing courtesy Incat Crowther)

Provincetown IV is powered by a pair of MTU 16V2000 M72 main engines, each producing 1122 kW. On sea trials, *Provincetown IV* cruised comfortably at 30 kn with full-load deadweight. She has a top speed of over 32 kn. A trim-tab ride-control system is installed to reduce vessel motions.

Principal particulars of *Provincetown IV* are

Length OA		30.0 m
Length WL		28.9 m
Beam OA		9.10 m
Depth		3.82 m
Draft	(hull)	1.55 m
	(propellers)	2.03 m
Passengers		149
Fuel oil		6434 L
Fresh water		1135 L
Sullage		1135 L
Main engines		2×MTU 16V2000 M72 each 1122 kW @ 2150rpm
Propulsion		2×propellers
Speed	(service)	30 kn
	(maximum)	32 kn
Generators		2×Cummins Onan 40MDDCA each 40 kW
Construction		Marine-grade aluminium
Flag		USA
Class/Survey		USCG Subchapter T

Starboard bow of *Provincetown IV*
(Photo courtesy Incat Crowther)

Quaranta from Curvelle

Incat Crowther has announce the launch of the exciting new super yacht, *Quaranta*. Developed by Curvelle and built in Turkey, *Quaranta* demonstrates many of the advantages of a catamaran platform as applied to a superyacht. As the vessel's name suggests, the vessel offers comparable interior space to that of a 40 m monohull yacht, but with a lower power requirement, reducing capital and operating costs.

To deliver the project, Curvelle's founder, Luuk van Zanten, assembled a team of experts, including builder Logos Marine and Lila-Lou of London, who designed the vessel's striking interior and exterior. Incat Crowther contributed naval architectural services including hullform development, arrangement and propulsion engineering.

The vessel offers functionality and flexibility, with six large cabin spaces located on the main deck. Each of these spaces can be configured as twin or double staterooms, or combined with the adjacent spaces to create three large suites.

Crew accommodation and service spaces are provided in the hull and a large lounge and dining space occupies the upper deck aft of the wheelhouse.

The vessel is powered by a pair of Caterpillar C32 ACERT main engines, each producing 1417 kW at 2300 rpm. The shaftline consists of ZF3050 gearboxes and a pair of fixed-pitch propellers. Incat Crowther has used its extensive experience to engineer a vessel which is optimised for efficient cruising and optimum range.

Incat Crowther is pleased to be a part of this project team, bringing a wealth of experience and knowledge to the project. Curvelle has delivered a class-leading product which is efficient, comfortable and flexible, all wrapped in a stylish package.

Starboard side of *Quaranta*
(Image courtesy Incat Crowther)

Principal particulars of *Quaranta* are

Length OA	33.7 m
Length WL	32.3 m
Beam OA	9.00 m
Depth	3.60 m
Draft (hull)	2.00 m
(propellers)	2.40 m
Crew	5
Guests	12
Fuel oil	16 500 L
Fresh water	4000 L
Sullage	4000 L
Main engines	2×Caterpillar C32 ACERT each 1417 kW @ 2300 rpm
Gearboxes	2×ZF3050
Propulsion	2×five-bladed propellers
Speed (service)	23 kn
Construction	Composite

Staterooom on board *Quaranta*
(Image courtesy Incat Crowther)

Port quarter of *Quaranta*
(Image courtesy Incat Crowther)

70 m Catamaran Fast Crew Boat from Incat Crowther

Incat Crowther has announced a first-of-type 70 m catamaran fast crew boat (FCB), compliant with the IMO HSC code and complete with a crew-transfer system consisting of dynamic-positioning equipment Class DP2 coupled with a stabilised access platform. Construction of the vessel has commenced at the shipbuilder Incat Tasmania, with delivery scheduled for September 2014.

The vessel will operate as a fast crew-transfer vessel for 150 offshore workers to multiple offshore installations.

The hull design has been optimised for high-speed transits, with specific features to limit the sea-sickness of transiting offshore workers. The on-board noise, vibration and indoor climate is in accordance with DNV comfort class notation. The vessel has been designed to operate in conditions of 40 kn wind and seas of 3 m significant wave height.

The high speed of the 70 m FCB allows operational cost efficiency over helicopter transfer for passengers and cargo, whilst the advanced design ensures that the crew arrive at the platform fit for work.

Crew transfer is completed primarily by a stabilised access platform, providing a level platform and gangway to access the offshore platform from the vessel. The access platform compensates for the vessel's motion by using six hydraulic cylinders. The vessel will hold station using dynamic positioning (DNV DYNPOS-AUTR R) and, in combination with the stabilised access platform, crew transfers will be performed in up to Sea State 4.

This vessel is the first catamaran to utilize this system, and the first to have the stabilised access-platform structure and supporting systems integrated into the design. For redundancy and operations in higher sea conditions, a crane-lifted personnel-transfer system is provided for up to two groups of nine offshore workers.

Whilst the primary function of the vessel is crew transfer, the vessel's arrangement provides flexibility with over 100 m^2 of cargo deck, rated at 2 t/m^2. This capacity will allow the vessel to complete cargo hot shots for up to 110 t of specialised equipment to a range of 300 n miles at speeds of up to 35 kn.

The vessel is under construction at the Incat Tasmania shipyard, with the design by Incat Crowther and production engineering by Revolution Design. The final product incorporates key experience and strengths by each of the parties involved. Incat Tasmania has the specialised facilities, construction methodologies and experience of very large aluminium catamarans. Revolution Design has incorporated the production engineering design techniques optimised over multiple build projects at Incat Tasmania.

The shipyard's construction capability and capacity has leveraged into this market with the oil-and-gas design experience of Incat Crowther; utilising the track record obtained from the design of the SEACOR CrewZer class fast catamaran crew boats. This class of vessel dates back to 2007, with the first-of-class vessel *SEACOR Cheetah*. The latest vessel in this class, *SEACOR Leopard*, has just completed sea trials in the USA. Incat Crowther has over 90 vessels operating or under construction for the world-wide oil-and-gas market, which includes eight Incat Crowther-designed crew boats currently operating in the Caspian Sea.

The high level of passenger comfort on the 70 m FCB will be achieved by the vessel's advanced semi-SWATH hullform, combined with a resiliently-mounted main cabin and superstructure, and active ride-control system consisting of T-Foil, interceptors and yaw stabilisers.

Passengers are accommodated on both the main deck and mid deck, with the mid deck featuring crew accommodation for 14. All crew cabins are ILO-compliant. The main deck also features VIP rooms, vending machines, luggage space and a large workshop.

The aft cargo deck measures in excess of 400 m^2, housing the stabilised access platform, dedicated landing area for the crane-lifted personnel-transfer system, as well as 10 ft (3 m) luggage containers and hot-shot cargo area.

Four MTU 16V4000 engines will power the vessel, driving Hamilton HT-900 waterjet propulsion units with a service speed of 30 kn at full-load condition and 90% MCR in Sea State 4. Four azimuthing drop-down thrusters forward will take care of manoeuvring, with the vessel having DP-2 equivalent DNV classification.

Safety of operation and environmental protection is a high priority; the environmental impact of the vessel's emissions to air, discharges to sea, deliveries to shore from the vessel, and protection against accidents, are controlled and designed in accordance with environmental class. The safety of the vessel's operation is prioritised by the bridge design and navigational equipment compliance with nautical safety class.

The new crew-transfer vessels will be delivered to Caspian Marine Services Ltd (CMS) in Baku, Azerbaijan, via a transit through the Volga-Don Canal. Once deployed, CMS will operate the vessels, providing crew-transfer and hot-shot cargo services to platforms in fields such as Azeri-Chirag-Deepwater Gunashli (ACG), the largest oil field in the Azerbaijan sector of the Caspian Sea, and Shah Deniz, a large offshore gas and condensate field. The oil and gas produced from these fields is transported by tanker for processing in Baku, and then transported via pipeline through Georgia and Turkey to the Mediterranean port of Ceyhan, or the Georgian port of Supsa on the Black Sea.

Principal particulars of the new vessel are

Length OA	70.0 m
Length WL	67.6 m
Beam OA	16.0 m
Depth	6.00 m
Draft (hull)	2.00 m
Personnel	150
Crew	14
Fuel oil	50 000 L
Fresh water	10 000 L
Grey water	3000 L
Sullage	3000 L
Main engines	4×MTU 16V4000 M73L each 2880 kW @ 2050 rpm
Propulsion	2×Hamilton HT-900 S waterjets
Generators	4×550 ekW
Bow thrusters	4×224 kW azimuthing retractable
Speed (service)	30 kn
(maximum)	36 kn
Dynamic Positioning	DNV DYNPOS-AUTR R control system
Crew-transfer	Ampelmann stabilised access platform Frog-9 crane-lifted rigid basket
Safety Equipment	12-person rescue boat 6-person MOB boat 2×200 pax liferafts and 2×00 pax MES
Construction	Marine-grade aluminium
Flag	Azerbaijan
Class/Survey	✠1A1 DNV HSLC Service 2, R1, EO, DYNPOS-AUTR, CLEAN-DESIGN, COMF-V(3) C(3), NAUT-HSC, NAUT-OSV(A) IMO DP Equipment Class 2

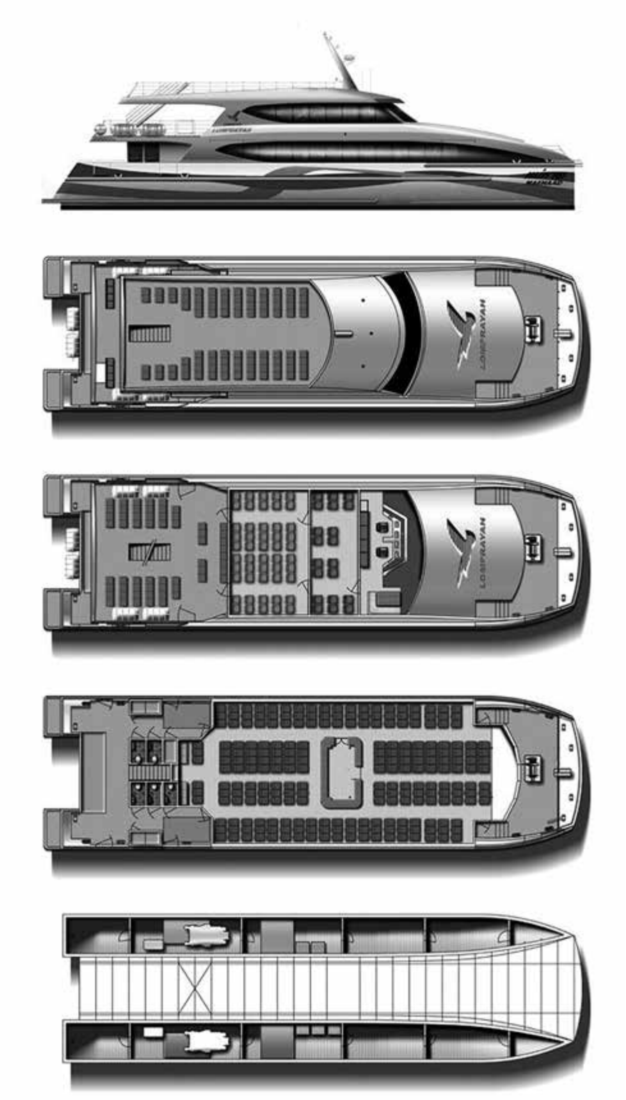
Starboard bow of 70 m fast crew boat
(Image courtesy Incat Crowther)

Starboard quarter of 70 m fast crew boat
(Image courtesy Incat Crowther)

Birds-eye view of 70 m fast crew boat
(Image courtesy Incat Crowther)

Launch of *Maehaad*

Incat Crowther has announced the launch of *Maehaad*, a 453 passenger 32 m catamaran ferry constructed by Dolphin Chumphon Marine in Thailand. *Maehaad* is the sixth vessel designed by Incat Crowther for Lomprayah High Speed Ferries, and follows on from the 29 m catamaran ferries *Thongslah* and *Koh Prab*. The success of these two vessels has led to a growth in Lomprayah's operation. *Maehaad* builds on the performance and efficiency of the



General arrangement of *Maehaad*
(Drawing courtesy Incat Crowther)

earlier vessels, with a new-generation plumb-stem hullform delivering excellent fuel economy and seakeeping and a very-low cost per passenger mile.

Passengers board the vessel through bulwark gates on both decks. The main deck has a large luggage area aft, as well as five toilet spaces. There is a large kiosk and bar amidships, whilst a second luggage area is provided at the forward end of the main-deck cabin. 233 passengers are accommodated on this deck.

The upper-deck cabin is split between a mix of economy class seats and VIP seats in a separate rooms. Outdoor seats are provided on the aft upper deck, whilst there are also seats on the roof deck.

A pair of MTU 16V2000 M72 main engines, each producing 1440 kW, were selected for the vessel, extending engine life and increasing maintenance intervals. At the vessel's service speed of 25 kn, the engine operates below 65% MCR in a fully-loaded condition. The vessel can reach speeds in excess of 32 kn.

Incat Crowther was contracted to deliver a full production design package for the project. This approach improves build efficiency and reduces material wastage. The package consisted of all major structure, including nested and cut

Maehaad on launch day
(Photo courtesy Incat Crowther)

aluminium, as well as major fitout components such as exhaust and air conditioning. The package also includes three-dimensional structure and systems design which detail all piping runs and components.

Incat Crowther is pleased to continue its successful relationship with Lomprayah High Speed Ferries to this sixth vessel.

Stewart Marler

Young Endeavour ULP and LPG Stowage from BCTQA

Burness Corlett Three Quays Australia (BCTQA) provided a detailed design package for the installation of LPG gas bottle and ULP container stowage with remote quick-release capability for STS *Young Endeavour*. The package included ripout drawings for the existing structure, installation drawings for new structure, a testing and maintenance plan as well as structural analysis of the aft platform. Manufacture of the stowage and release system has been completed and successfully integrated into the existing ship structure. The testing plan has been implemented and has proven the system to be reliable.

LPG (L) and ULP stowage with RIB stowage on *Young Endeavour*
(Image courtesy BCTQ)

Young Endeavour Inclining Experiment by BCTQA

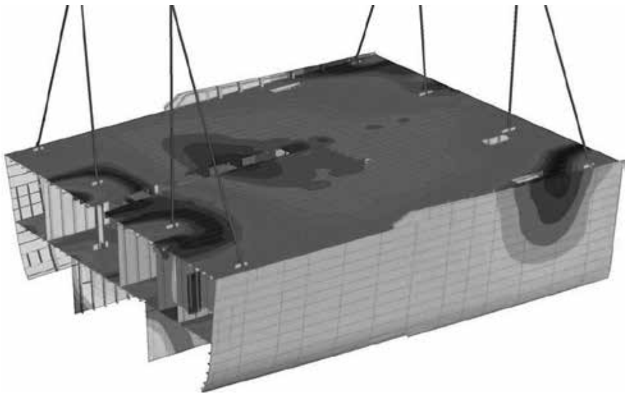
BCTQA recently conducted an inclining experiment onboard STS *Young Endeavour* at HMAS *Waterhen.* The inclining experiment was witnessed by a member of the Directorate of navy Platform Systems and the new lightship particulars were accepted. BCTQA also completed a new stability book for the vessel which has also been accepted by DNPS.

Young Endeavour ready for inclining
(Photo courtesy BCTQ)

AWD Support by BCTQA

BCTQA continues to provide production support to ASC and Forgacs for the $8 billion air-warfare destroyer project for the Royal Australian Navy. The BCTQA production support involves 3D modelling, finite-element calculations, detail design drawings, independent reviews and third-party certification of their assessments.

A straight vertical lift is being planned once Blocks 401 and 403 have been joined together.



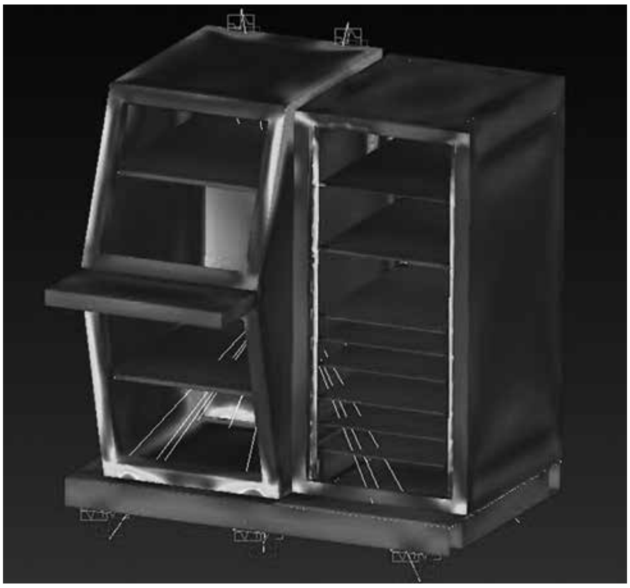
Finite-element analysis model of AWD Blocks 401 and 403 joined
(Image courtesy BCTQ)

The accompanying photo shows the finite-element analysis (FEA) model of the two blocks joined together for a total predicted mass of 162.5 t. Blocks 401 and 403 had previously been successfully lifted and turned independently, and the majority of the bracing structure was removed to allow for equipment installation. However, FEA showed that some of the bracing structure needed to remain in place for the grand block lift, and two additional lifting lugs were also recommended to be installed towards the topside shell of the grand block. Detailed calculations and drawings were provided to allow fabrication of these lugs.

Rack Shock Analysis by BCTQA

BCTQA recently completed a finite-element shock analysis and certification of a communications rack to be installed on the mine-hunter coastal class of vessel for the Royal Australian Navy. The natural frequency of the structure, as well as the deflections and peak stress levels within the structure were determined when a shock impulse was applied to the base of the resilient deck mounts. These were compared with NAVSEA shock design limits.

BCTQ News Update, September 2013



Finite-element model of MHC communications rack
under shock loading
(Image courtesy BCTQ)

John Oxley Restoration

A major milestone this year for the engineers, hull team and riggers has been the return of the repaired rudder to the stern frame. Both engineers and metal fabricators have worked together for some time to repair the rudder and steering gear to the stage where it was possible to reinstall it. The initial task was the removal of the hand-steering gear, followed by removal of the rudder, tiller and badly-rusted quadrant. Once ashore, the tiller was repaired and riveted to a newly fabricated quadrant. The hand-steering gear was also overhauled and has been set aside for later return. The rudder itself was in reasonable condition, but the upper steel plating was badly rust damaged and needed replacement. A new piece of 22 mm steel was welded and riveted in place. New pintles and bushes were machined and prepared. The rudder has a mass of more than 2 t and is an awkward and unwieldy object to lift. Careful thought went into placement of slings and strops, and the rudder was craned into place.

The fitting and riveting of the last hull plate took place in 2012. From here on, work on the main deck could commence in earnest, with the initial task being to remove the old deck. Unfortunately much of this timber was not reusable as it had had a long and hard life. Nevertheless, most of this timber was being kept for future re-use somewhere else on the ship. Under the teak working deck lies her structural steel-plate deck. Apart from the need to for a deck to provide a safe working surface, the deck is necessary for keeping the water out, and decks must also carry large structural loads when a ship flexes in a seaway. Unfortunately, museum-ship owners often find that the steel plates under wooden decks are badly rusted and comprehensive repairs are necessary. *John Oxley* was no exception, and the hull team have started repairs aft and are moving forward, lifting the old wooden decking and then attending to rusted coamings and the steel decking itself. Progress so far has seen new steel plates laid as far as the engine spaces on the starboard side and a start has been made on lifting the deck portside.

While main decks and coamings are under repair, a number of smaller deck fittings have been removed to the workshop for repair. These fittings include cowl ventilators which service the cabins below the main deck, and similar but larger ventilators from the boat deck. This is basically heavy duty panel-beating work and the welders often return to the older skills of oxy-welding to repair these thin steel sections.

One of the more interesting engine-room auxiliaries is the large Dawson & Downie air pump. While this pump ostensibly extracts exhaust steam condensate from the condenser, it is sized large enough to remove the high volumes of very-low-pressure air which is a nuisance in condensing steam plants. The engine has seen a lot of work as it is rarely stopped when the ship is in steam. The Dawson & Downie pump steam chest is of the shuttle-valve type, which will be familiar to engineers who have worked on the more-common Weir pumps. The pump has a flat-faced shuttle valve. This feature is unusual and rare. The SHF knows of no other ships with a Dawson & Downie shuttle-valve pump. Dawson & Downie are still in business and are still producing steam pumps! The air-pump assembly work continues with testing at workshop level. Because of its size, the pump will need to be broken down into sub-assemblies for craning back into *John Oxley* and final assembly.

The electrical team at this stage of the project is not yet much involved in restoration, but are very active in support services. Work includes construction-site-level wiring, wiring local power supplies, installing lighting and then moving everything around when the hull team move forward.

The teak skylights at main-deck level have been removed so that the hull team can replace rusted steelwork. The teak skylights rest on steel bases, which have been removed from the deck, and the fabricators have replicated these structures. The skylights are also watertight structures, which must resist the press of tonnes of water when green seas come on board and fill the decks. Work on restoration of the skylights has commenced. Teak is a wonderful timber as it can almost always be restored back to its original finish.

A *John Oxley* volunteer recently visited Paisley in Scotland and, despite the awkward access, climbed down onto the muddy banks of White Cart Creek at Abbotsinch where John Oxley was built, and brought back photos of the small waterway where, once, ships like *John Oxley* were built.

For further details and photos of progress, visit the *John Oxley* website

www.shf.org.au/explore-the-fleet/john-oxley-1927-steam-ship/

John Oxley's refurbished rudder back in place
(Photo from Sydney Heritage Fleet website)

Cruising

After the winter quiet, with only *Pacific Jewel, Pacific Pearl* and *Carnival Spirit* working out of Sydney, the summer cruise season got under way in October with visits to Sydney by these vessels plus *Sea Princess, Radiance of the Seas, Dawn Princess, Rhapsody of the Seas, Sun Princess, Volendam, Celebrity Solstice* and *Oosterdam.* November moved into a higher gear, with visits by these vessels plus *Ocean Princess* and *Voyager of the Seas*. Vessels berthing regularly at the Overseas Passenger Terminal at Circular Quay is a sure sign that the summer cruise season is under way.

Phil Helmore

INTERNATIONAL FLEET REVIEW

The Australian White Ensign is flown over Sydney Harbour on 4 October as visiting warships gather for the International Fleet Review to celebrate the centenary of the arrival in Sydney for the first time of the RAN's fleet unit on 4 October 1913. On that occasion the battlecruiser HMAS *Australia* led HMA Ships *Sydney*, *Melbourne*, *Encounter*, *Parramatta*, *Yarra* and *Warrego* into the harbour which has been the principal home of the Royal Australian Navy ever since.

In this photograph the Royal Navy Type 45 destroyer HMS *Daring* is secured to No. 2 naval buoy as the ships arrive for the review (RAN photograph)

The Malaysian frigate KD *Jebat* at anchor in Jervis Bay on 2 October with the Indonesian corvette KRI *Sultan Iskander Muda* and the cruiser USS *Chosin* in the background
(Photo John Jeremy)

USS *Chosin* steams in formation with the Review ships for a Photex en route to Sydney for the Review
(RAN photograph)

The Tall Ships battling strong winds, rain and occasional hail as they enter Sydney Harbour on Thursday 3 October 2013
(Photo John Jeremy)

HMAS *Broome* leading a column of small ships in the western channel of Sydney Harbour
during the International Fleet Review on Saturday 5 October 2013
(Photo John Jeremy)

The Governor General of Australia, Her Excellency Quentin Bryce AC, accompanied by Prince Harry, taking the salute from HMS *Daring* during the Fleet Review
(Photo John Jeremy)

The reviewing ship, HMAS *Leeuwin*, followed by the Australian National Maritime Museum's patrol boat *Advance* approaching HMAS *Yarra* and KRI *Sultan Iskander Muda* during the Review
(Photo John Jeremy)

The Sydney Heritage Fleet's steam launch *Lady Hopetoun* carrying retired Chiefs of Navy and the only vessel taking part in the Review which was also present on 4 October 1913, passing HMS *Daring*
(Photo John Jeremy)

The Tall Ship *Windeward Bound* at anchor ahead of the Nigerian Navy's frigate NNS *Thunder*
(Photo John Jeremy)

Sydney Harbour during the light and firework spectacular held after the Review. HMAS *Sydney* (right foreground) was positioned just east of the Sydney Harbour Bridge
(RAN photograph)

USS *Chosin*, HMS *Daring* and HMA Ships *Parramatta* and *Perth* open for visitors at Barangaroo in Darling Harbour on Sunday 6 October
(RAN photograph)

The start of the Tall Ship's Race to Auckland on Thursday 10 October 2013. The 'starter's boat' is HMAS *Gascoyne*
(Photo John Jeremy)

PACIFIC 2013

Sean Costello of ASC consulting with session chair Ian Laverock before giving his address to a well-attended session of the Pacific 2013 International Maritime Conference
(Photo John Jeremy)

Phil Helmore and Trevor Blakeley on the RINA stand at Pacific 2013
(Photo John Jeremy)

One of the exhibition halls at Pacific 2013. The exhibition had the highest number of visitors ever as 17 922 people explored the exhibits by 401 companies from 19 different countries
(Photo John Jeremy)

Software for Rapid Evaluation of Concept Vessels

Richard McKimm, Philip Watt, and Kathryn Dawes
Navy Engineering Division, Department of Defence

Introduction

It is beneficial for the RAN to possess the capacity to rapidly estimate the characteristics of high-level concept designs of surface ships, given a set of requirements for payload, speed, range and other capabilities. Software which allows rapid and consistent generation of potential solutions from a given set or range of input parameters allows the RAN to more quickly and thoroughly explore solutions when addressing capability requirements for future ships. Trade-off studies can be generated by successive runs with small modifications to input requirements.

The software described here, in association with other applications, allows for the examination of some of the main design and cost drivers of naval ships, including size, weapons/equipment outfit and propulsion requirements. The simple early-stage design approach avoids many of the more-complex aspects of ship design (such as detailed hullform definition, stability and deck layout) by adopting overall geometry data from a suitable basis ship which is then re-scaled to an appropriately-sized ship to satisfy the specified requirements. While the final output of this software is by no means a complete ship design, the ability to produce high-level concept alternatives in minutes has demonstrated the potential to simplify the process of generating alternative solutions and drastically speed up support for stakeholders at the early stages of a naval ship acquisition project.

About the Program

This program is designed to rapidly estimate the particulars (size, mass, engine power, etc.) of a ship which would fulfil a number of capability requirements (such as maximum speed, payload, weapons fit, etc.) The program calculates many of the ship's parameters based on regression curves which have been created from data for existing ships. This means that it is not likely to produce results exactly matching existing ships. The solution, however, has sufficient accuracy to be a valid concept model for early stage design.

The program, currently referred to as the Concept Exploration Program (CEP), was originally written in 1993, in GWBasic, for landing craft of various descriptions. It was updated into a QBasic program in 1995 and then into a destroyer-prototyping program in 2002. Its current incarnation is Visual Basic Script with an HTML interface. The program now calls upon external spreadsheets to do most of the calculations which serve as modules suitable for editing by multiple contributors. The code has been modified extensively since its first iteration.

It has been used more recently to support early concept-design studies for project SEA5000 (Future Frigate) as well as project SEA1180 (Offshore Combatant Vessel)

Program Operation

'CEP.hta' is the top level program. Written as an HTML application, it presents a web-page-style front end to the user, containing drop-down boxes and text boxes for inputs and outputs.

The user provides a number of inputs through this interface, including maximum speed, cruising speed, payload, range, weapons outfit, number/type of deployable vehicles (helicopters, RIBs), and level of reserve electrical power.

The user is also required to select an engine configuration. Most combinations of diesel and/or gas turbine and/or electrical propulsion options are available, however, with varying levels of fidelity of the underlying data.

After processing, the user is provided with a description of a suitable vessel including the main geometric particulars such as: LOA, LWL, BOA, BWL, drafts, centre of mass/buoyancy, water-plane coefficient, displacement, and total deck area. Other information, such as the required complement, mass estimates, power and fuel requirements, are also given on this screen. This represents a summary of the total output, which is written to a text file and contains more detailed information.

Module Descriptions

The program takes inputs from the user through the user interface or through various input files for more-detailed inputs.

Creating a valid ship which meets the requirements of the inputs is a complex task handled internally in the code as the design process involves multiple feedback effects — for example, increasing the ship's mass while maintaining a requirement for maximum speed will mean that larger engines are required, further increasing the mass and hence the power requirement.

The program attempts to create a valid ship model by creating a ship based on an exemplar and then iteratively altering the ship particulars to converge on a valid design. Two things are required for the definition of 'valid' here: the displaced water must have the same mass as the ship (a rule enforced by the laws of nature in a real ship) and deck space must be adequate to satisfy the requirement.

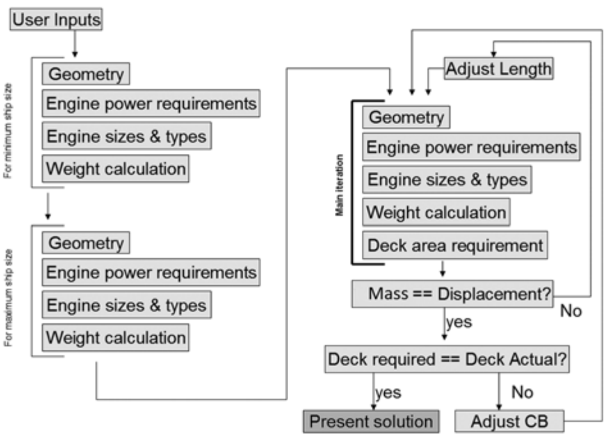


Figure 1: Simplified program flow diagram. Some modules in the main iteration are not shown in this diagram

Program execution takes the form of a number of modules, each of which is described in the following sections.

Cep.hta — Top-level Executable

This is the top-level program. It handles the user interface and does some of the processing, including the main iterative loop. The program seeks to balance the displacement of the vessel with its estimated mass by converging on a solution using the secant method. Initially the program makes both an upper and lower bound estimate of the overall length of the ship, nominally set to 50 m and 190 m. These bounds have been chosen based on the nominal LOA of the limits of the ships which the program is currently intended to examine, from patrol boats through to cruisers. From the length, the program estimates the other dimensions and mass of the ship and checks the displacement (using a specified draft, given as a function of ship length) against the mass. If the mass is greater than displacement, the volume of the ship is too small and length is increased for the next iteration. Conversely, if the mass is smaller than displacement then the volume of the ship is too large, and length is subsequently reduced. Since the initial estimates of length are the minimum and maximum lengths respectively, if checking shows that a solution will have length outside this range the program is terminated at this point and the user is informed that no feasible solution could be found within the search range.

If the mass roughly equals the displacement, then the program attempts to converge on deck area requirement by altering the block coefficient. Maximum and minimum estimates are made for block coefficient and the total deck area is compared to the required deck area. If the deck area exceeds requirements, then the block coefficient of the ship is increased. This causes the length and consequently other key dimensions to be decreased in the next iteration, resulting in a net reduction in deck area. The reverse occurs if the deck area is insufficient.

The program attempts to converge to a solution for deck area using interval halving for the length and block coefficient.

After the length and block coefficient have been modified, the dependent characteristics of the ship (mass, deck area, and everything else) are recalculated and the process iterates until both deck area and displacement meet the requirements to within a specified tolerance or a maximum number of iterations is reached. The program returns a solution through the user interface and an output file also indicating whether or not a converged solution has been found.

As the code is iterative in nature, the modules are run sequentially for every iteration with calculated outputs from some modules serving as inputs to others. This means that for the first iteration of the main loop, many of the inputs are default values or estimates made with little or no supporting information. For this reason the program is prevented from returning a solution based on the first run through the main loop.

Output Scaling

The program gives the user the option to freeze some parameters to specified values, such as the amount of fresh water or the number of crew. The option also exists to allow a weighted combination of the user-provided value and the value calculated by the software. For example, if the crew of a vessel is expected to be close to 200, the crew parameter could be set to be 150, and scaling set to say 0.25, leading to an output value which would be calculated as follows:

$$\text{Crew} = 150 + (0.25 * \text{crew\_calculated})$$

where crew_calculated is the output of the complement calculator module (i.e. the estimated number of crew based on the ship's physical characteristics). This feature provides a convenient means of either partially or fully over-riding parameters estimated within the program.

Geometry Simulation Module 'Geosim'

Based on the inputs given through the user interface (range, payload, speed and engine configuration) this module calculates the measurements for all the relevant ship parameters such as waterline length, beam and height of decks, longitudinal centre of buoyancy of vessel, etc., using trend lines for geometric relationships. These can also be scaled using the output scaling described earlier.

This calculation is typically based on rescaling the dimensions of an existing ship. The estimated ship has the same number of decks as the existing ship, the superstructure is the same shape and ratios of deck sizes are typically similar. This approach avoids the complexity of a full hullform analysis but does mean that a ship of similar size and type should be selected as the geometric basis of the concept ship. This will help ensure the results lead to a sensible ship configuration with a reasonably accurate prediction of the size and mass. For example, one would not expect an accurate prediction of a destroyer if it were based on the layout and geometry of a significantly scaled-up patrol boat that has far fewer tiers of decks. In future it is intended to integrate a 3D graphical geometry model in place of the mathematical relationships that currently define the ship geometry.

Due to either the availability of design data to Navy Engineering Division or because the type was representative of the size of a baseline ship subject to examination, ship classes which have served as the basis for this geometric scaling module have so far included the Khareef-class corvette, the Anzac-class frigate, the Armidale-class patrol boat, the Serviola-class OPV, and the Transfield OPC.

Mass Calculator Module

This module calculates the lightship mass of the vessel by summing the estimated masses of the components of the vessel. The component masses are estimated from trend lines based on the masses of the components from five known ships ranging from frigate to destroyer size. The items considered span the complete Technical Subject Code (TSC) and include hull plating and structural members through the outfit of compartments.

This module takes the form of an Excel spreadsheet, based on the earlier Shipwt2 program. This software was originally designed to generate a first-pass weight estimate for ships based on key physical parameters, and this is the purpose for which it is employed in the concept evaluator. There is, however, a need to expand this module to include data for smaller combatants and also to generalise it to consider vessels other than frigates and destroyers such that weight estimates are not obtained from extrapolating significantly outside the bounds of the dataset.

Variable load items which are not part of the lightship mass such as fuel, fresh water, provisions and crew, are not included in this mass estimate. These masses are calculated within the main executable or in separate modules and added to the lightship mass to obtain full load mass before it is checked against available displacement.

Engine Power Requirement (Holtrop) Module

This module calculates the power required to move the ship at the desired speed. This is done by calculating resistance using the equations described in papers by Holtrop and Mennen [1][2][3]. The module is also set up to very approximately estimate the resistance of multi-hulls through the use of the equations outlined byInsel and Molland [4]; however, the overall CEP algorithms, and in particular the lightship weight estimation module, have not yet been adapted to deal with ships beyond monohulls.

This module predominantly uses information pertaining to the geometry of the vessel, such as dimensions and form coefficients, surface areas of the hull and various appendages, the frontal area and aerodynamic drag coefficient, etc. All the normal resistance components are accounted for. Propulsive efficiency currently follows a simple trend curve depending on propulsion type, but this is intended to be refined in the future with at least a robust calculation of feasible propeller efficiencies based on the number and diameter of propellers and a B-series propeller optimisation routine.

Due to the modular nature of the overall program, in principle it is also possible to exchange the Holtrop method for, say, a Mitchell-theory-based resistance-prediction method which would still be relatively computationally efficient and robust.

Fuel Module

This spreadsheet calculates the amount of fuel required to achieve the specified range at the specified cruising speed. Calculations are based on the approach outlined in [5]. This module considers factors such as cruising speed, specific fuel consumption of propulsion engines and generators, transmission efficiencies, and 24-hour average-endurance electrical load.

Complement Module

This calculates the crew of a vessel currently based on a simple trend line created by plotting the number of crew on a vessel against the displacement of 22 known naval combatant vessels operated by modern western navies. The complement is then further subdivided into officers, senior sailors and junior sailors by fixed ratios, as these form separate input requirements for estimating outfit weights in the lightship mass estimating module. As noted earlier, the complement can also be hardwired to specified naval requirements if preferred.

The complement estimation influences required deck areas, accommodation outfit weights, electrical load demands and, naturally, the weight of crew, provisions, and fresh water carried. It would therefore be desirable to develop a more-robust functionally-based complement estimating module rather than one based only on displacement.

Electrical Load Module

This module calculates the approximate total electrical load and, hence, required installed electrical-generation capacity for the vessel. It uses input parameters such as the number of crew, total deck area, volume of ship and total propulsion load. This information is most useful for determining the power and mass of required generator sets, as well as their space and deck area requirements, which are used in the next iteration through the program.

This module uses a historical trend in electrical loads, as well as loads imposed by major installed surveillance, navigation, weapons and replenishment-at-sea systems to predict total electrical load. The data set used to calculate trends includes several current and proposed RAN ships across a considerable size range from minehunters to destroyers.

The estimation of power requirements is divided into a number of categories: radar load (assumed constant in this version), hotel load (calculated from a trend line against ship's complement), electrical distribution load (switchboards, distribution losses, etc. calculated from internal deck area), auxiliary load including HVAC (calculated from the total enclosed volume of the ship), propulsion auxiliaries and steering load (calculated from total installed propulsion power).

A number of loads are calculated by this module, the full load (known as the rated load), the functional/battle load and the cruise/peace load. Total electrical power requirements are calculated from the functional/battle load plus a percentage redundancy specified by the user. The default is 50% (so half of the functional/battle load is added as reserve power). The 24-hour average-endurance load is also calculated, as this is used to predict fuel consumption when assessing the range requirement. It is defined as follows:

$$P_{24hr} = 0.75\ (P_{cruise} - P_{PA\&E}) + P_{PA\&E}.\ [6]$$

where P_{24hr} = 24 hours average endurance load, P_{cruise} = cruising electrical load, $P_{PA\&E}$ = propulsion auxiliary and steering electrical load.

At present, electrical propulsion power requirements are not integrated in this module although it would be straightforward to incorporate. Weapon electrical loads are similarly not accounted for and this will be addressed as the software undergoes further development.

Deck Area Module

This spreadsheet-based module calculates the amount of deck area required on the ship. This is done by estimating the deck area requirements for various categories of spaces on board the ship and then summing them.

For some categories, deck area is based on the Naval Materiel Requirement Set. For example, the space allocated to dry provisions and refrigerated storage is directly proportional to the number of crew and the endurance of the ship. Other estimates are based on trend lines of deck area plotted against relevant variables. The deck area required for machinery spaces is based on trends of installed power vs machinery space as measured from general arrangement drawings for existing vessels. The deck area required for weapons, ships boats, and other external items have been estimated from drawings and can be selected from a list on the input screen.

The data set used to generate the trend lines for this module includes a range of combatant and non-combatant vessels of varying size and type.

As a way of informally verifying these results, the predicted deck-area requirements can be compared to those of existing ships within the data set, as shown in Figure 2 below.

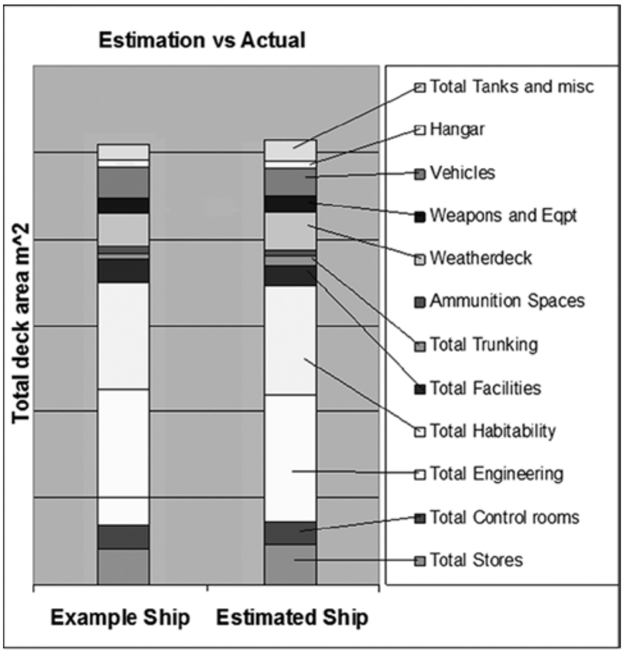


Figure 2: The breakdown of deck-area estimation produced by the program compared to that of one of the ships in the dataset used for developing the deck area trend lines.

Engines Module

Given a propulsion power requirement and user requirements for cruise and maximum speed, this module calculates the number and power of the propulsion engines required. The user can provide a power output per engine, a range of acceptable power outputs or a required number of engines. The program returns the number and power of engines required, within these constraints.

The engine configurations available as input options are also handled here — cruise and sprint engines are calculated separately based on cruise-and-sprint power requirements. The 'And'/'Or' options (e.g. CODAG vs CODOG) are handled by either including the power of the cruise engines in sprint power or not, respectively, and adding a mass to account for a two-speed gearbox in 'And' options.

As for the mechanical propulsion options, electric propulsion options have transmission losses added to account for power conversions in generators, controllers and electric motors. Masses of the associated machinery are calculated based on trends of existing ships or systems in the mass calculator module.

Results and Evaluation

When provided with inputs which roughly correspond to existing ships, the output parameters match reasonably well with the actual ship. However, this is very dependant on a sensible choice of basis ship in the 'Geosim' module. This is because there are many consequential effects from the geometry of the ship. For instance, if a broad-beamed 'Geosim' model is adopted along with a high-speed requirement, the resulting ship will require powerful engines to overcome the high level of hydrodynamic resistance associated with such broad-beam ships. Large engines in turn increase mass, which drives length, and so on.

The modules, which have been assessed individually all produce reasonable approximations. An example of this is shown in Figure 2 where the predicted deck area of a particular ship is compared with the calculated concept approximation. Admittedly, this test case is also part of the data set used for generating the trend lines, but this is unfortunately necessary due to the small number of ships for which this data has so far been transcribed. More-rigorous validation could be undertaken by testing with independent cases; however, removing ships from the data set simply to serve as a test case has a noticeable effect on the trend lines. At a minimum; the results demonstrate a good degree of fit for the trend lines used.

When given extreme or unusual inputs, the program may fail to converge on a solution. Cases where this occurs include those which require a high payload capacity with high speeds, or a high range combined with high cruising speed. Outside of these situations the program generally converges on a credible solution, despite the lack of guaranteed stability of the interval halving and secant methods used.

Comparative Analysis – Frigate Solution Space Exploration

The following exemplifies the use of the software for solution space exploration by modifying platform requirements for an example frigate, and comparing the results. The parameters kept constant were the CODAG engine configuration (irrespective of engine size), combat system payload of 1040 t and a 30% burnable fuel reserve. Maximum speed, cruising speed and range were each modified to explore the effect of a change to any of these requirements.

Initially, the maximum speed was modified to examine the effects on length, displacement and power requirements. For this analysis, range was set to 6000 n miles at 18 kn.

Maximum Speed (kn)	27	30	33	Change from 27 to 33
Length overall (m)	168	172	177	5% increase
Full load EOL Displacement (t)	8215	8625	9249	13% increase
Required Power for Max Speed (kW)	30 283	49 012	77 423	156% increase

This comparison illustrates that increasing maximum speed has modest impact on ship size. However, the impacts on the propulsion requirements are significant.

The effect of increasing the cruise speed was also investigated. The results are tabulated below. Range was set to 6000 n miles and maximum speed 27 kn.

Cruise Speed (kn)	16	18	20	Change 16 to 20
Length overall (m)	165	168	174	6% increase
Full load EOL Displacement (t)	7758	8215	8874	14% increase
Fuel mass (excluding Av Fuel) (t)	926	1124	1408	52% increase
Required Power for Cruise Speed (kW)	5351	8203	12 393	132% increase

The solution space was also explored in the range dimension. Maximum speed was 27 kn and cruise speed 18 kn.

Range (n miles, with 30% BFR)	3000	6000	9000	Change 3000 to 9000
Length overall (m)	158	168	179	13% increase
Fuel mass (t, excluding Aviation Fuel)	525	1124	1803	243% increase
Displacement (t, full load EOL)	6984	8215	9597	37% increase

Using the concept evaluation software to perform these kinds of solution space explorations allows the RAN to quickly assess the feasibility of changes to capability requirements. When linked with high-level concept cost-estimation tools, consistent cost-benefit assessments of variations in high level-naval requirements become possible.

Future Development

Many of the modules utilise trends from existing ships to predict the concept ship's characteristics. This yields results sufficiently accurate for concept exploration in most cases. The quality of the predictions does depend on the quality of the data set being used to generate the trend equations. As already noted, in some modules, the data set is quite small and would benefit from being expanded. Once the data set is sufficiently large it may be possible to improve predictions by dividing the data set into categories (e.g. patrol boats, frigates, hydro/survey ships, etc.) and then restricting the data set based on the type of vessel being investigated.

At the time of writing the running time required for the program to converge on a solution for a single concept design is about 10 minutes when using a standard PC. It would be desirable that this be reduced to one minute or less. This would allow the code to be used in real time to facilitate concept evaluation during capability discussions. A faster computation time would also be required if the code were to be integrated into a design-optimisation environment. This speed-up could be achieved by exporting modules from Excel spreadsheets to a faster programming language (such as C++) once modules are completed. Excel has proved to be a good environment for initial development as sheets can be written, modified and understood by those without significant programming knowledge. However, the memory requirements and running times when using Excel-based modules are considerably greater than for most commonly-used programming languages.

Weapons and equipment outfit is not yet well accounted for aside from a user-defined combat-system payload weight. Some modules contain incomplete or not-yet-enabled functionality to account for the effect of different weapons fits but the necessary information is not being passed to these modules (with the exception of the deck area module and weight summation).

At present, the "payload" input by the user accounts for the mass of items such as weapons, sensors, ammunition, deployable vehicles and their associated fuel requirements. This will eventually be replaced with in-built mass calculations for user-defined combat-system items as the code is further developed.

Occasional problems relating to convergence of the iterative schema (as mentioned above) should be addressed.

A better representation of the geometry of the ship would be a desirable development to give some form of visual feedback to the designer rather than numerical values for various hull measurements. This could be achieved through a script-driven CAD package such as Rhinoceros and a library of CAD models corresponding to each basis ship. Initial experimentation with such an approach has been undertaken.

Conclusion

When addressing future capability requirements for RAN ships, the CEP provides the ability to rapidly estimate the high-level characteristics of potential designs. By completing successive runs while altering the requirements, as shown in the results, the CEP is able to show the changes that these cause to the ship characteristics. Examining these changes is the main value of the program for the concept-development phase of RAN ship acquisition projects.

While the potential provided by the CEP is vast and initial results have been quite promising, in its current form the program is limited in a number of ways. It is hoped that, in the next iteration and update of the program, the limitations in the data underpinning the calculations and the programming language will be addressed.

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EDUCATION NEWS

Australian Maritime College

Flexible New Lab Space to Promote Active Learning

Maritime engineering students now have access to a state-of-the-art learning environment following the conversion of an unused facility shed into three modern laboratories.

The project was designed by Anthony Dalgleish from Philp Lighton Architects and funded by the University of Tasmania.

The Acting Director of the National Centre for Maritime Engineering and Hydrodynamics, Giles Thomas, said that the aim was to provide a flexible lab space which was in-line with their teaching philosophy of active, problem-based learning.

"We were quite lucky as we were working with a big, open space to begin with and wanted to try and use that space as much as possible," A/Prof. Thomas said.

"There are three labs, but we've installed glass bi-fold doors so that they can be opened out into one big lab. The room can be reconfigured to suit different class sizes and projects — it's a very effective use of space."

The labs are structured around three work spaces to test mechanics and structures, electrical systems and electronics, and control systems.

They will be used primarily by first- and second-year maritime engineering students but there is the potential for application right the way through to final year and research projects.

The labs were designed with future expansion in mind, with the shed's original mezzanine floor being dropped to allow for the possibility of two more levels in the building.

"We now have all the engineering labs in one location, which is a benefit not only to the students but also to the technicians that service them," A/Prof. Thomas said.

"The labs were previously located in the Swanson Building and UTAS Building E, and the new development has allowed more teaching space to be freed up within those buildings."

Prof. Neil Bose opening the new laboratories at the AMC
(Photo courtesy AMC)

University of New South Wales

Undergraduate News

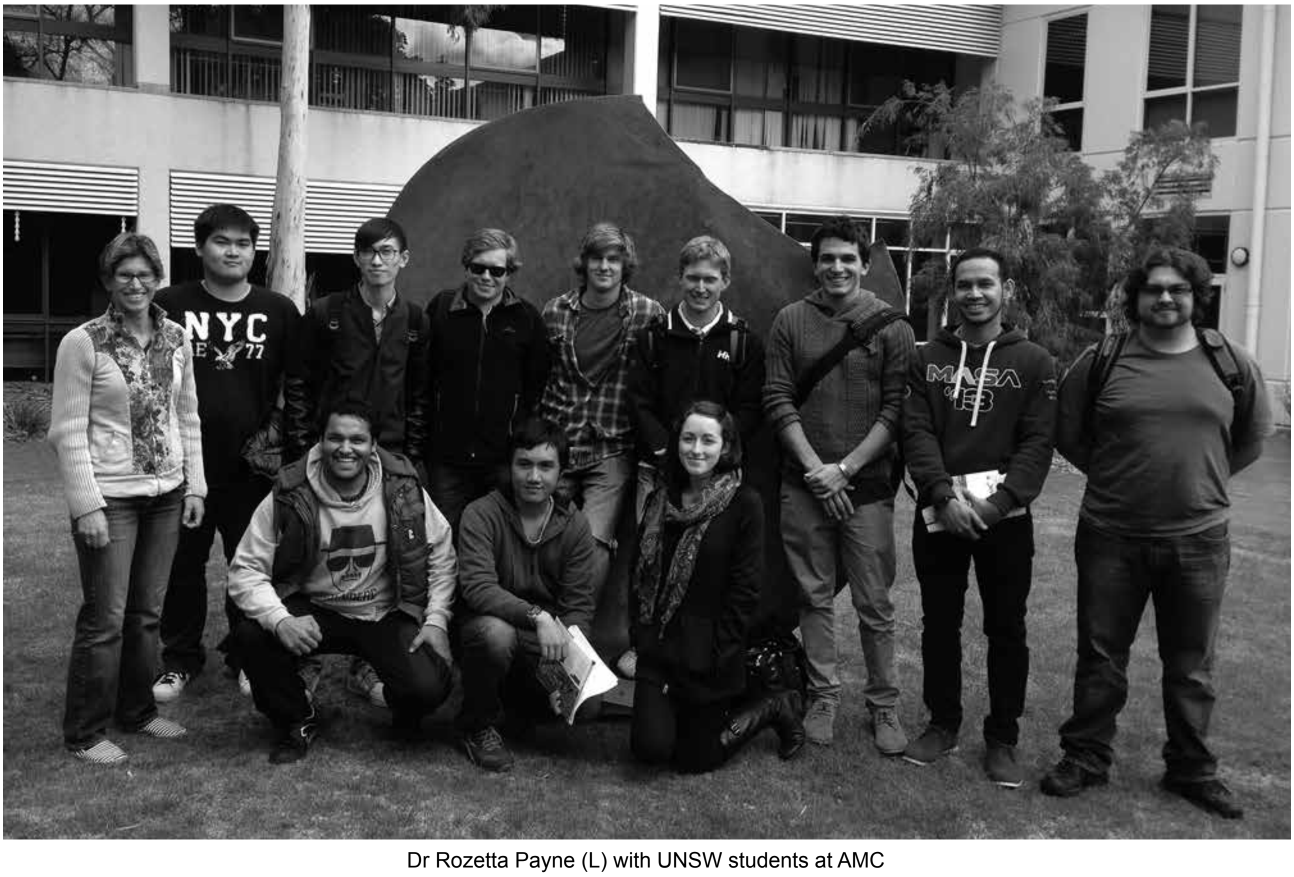
Visit to AMC

On 10 and 11 October the Year 3 students studying Ship Hydrodynamics visited the Australian Maritime College accompanied by Dr Rozetta Payne. The visit was organised by Dr Tim Lilienthal, and UNSW is grateful for AMC's hospitality.

The group conducted resistance tests on a model of the AMC vessel *Bluefin* in the towing tank, supervised by Dr Tim Lilienthal, saw a demonstration of the capabilities of the model basin, and then conducted seakeeping tests on the model of *Bluefin* in the towing tank. Next day they had a presentation on cavitation by Dr Bryce Pearce, which they enjoyed, and then were given a demonstration of cavitation in the cavitation tunnel, a presentation on research activities and opportunities at AMC by Dr Jonathan Binns, and were introduced to the ship-handling simulator by Mr Damian Freeman.

The students all came away with a better understanding of ship model testing and how it is done in practice. It certainly helped to have naval architects talk about the various aspects of testing and research, and their explanations of the processes brought out the realities and practicalities which you don't get in the theory.

Dr Tim Lilienthal (L) showing James Heydon how to operate the controls on the towing-tank carriage
(Photo courtesy Syahmi Hashim)



Dr Rozetta Payne (L) with UNSW students at AMC
(Photo courtesy Syahmi Hashim)

Model of *Bluefin* at 1.61 m/s in the AMC towing tank
(Photo courtesy AMC)

Demonstration of vessels in the model basin at AMC
(Photo courtesy Syahmi Hashim)

Visit to Incat Tasmania

The students took the opportunity, while in Tasmania, to visit Hobart where they were shown over the Incat Tasmania facility at Derwent Park by Mr Saied Amani, Structural Engineer at Revolution Design. UNSW is grateful for their hospitality.

Incat had two vessels at various stages of construction; an 85 m wave-piercing catamaran car ferry, and a 70 m catamaran fast crew-boat for Caspian Marine Services for operations in the Caspian Sea oil industry in Azerbaijan.

It was instructive to be able to see, at first hand, the details of construction. The theory is interesting, but seeing construction under way brings it alive!

85 m wave-piercing catamaran ferry under construction at Incat Tasmania
(Photo courtesy Syahmi Hashim)

70 m catamaran workboat under construction at Incat Tasmania
(Photo courtesy Syahmi Hashim)

In addition, HSV2 *Swift* from the US Navy was alongside at Incat, undergoing her five-year survey and refit. She was built in 2003 by Incat and her principal particulars are

Length		98.0 m
Beam		27.0 m
Draft		3.40 m
Displacement		1,695 t full load 955 t standard
Deadweight		615 t
Cargo deck		2670 m^2
Crew		35
Propulsion		Caterpillar 3618 marine diesel engines
Speed	(maximum)	45 kn
	(service)	30 kn
Range		3500 n miles

HSV2 *Swift* alongside at Incat
(Photo courtesy Syahmi Hashim)

Thesis Conference

At the School's annual undergraduate thesis conference on 9 and 16 October the following presentations by naval architecture students were made:

Bradley Abdilla *First-principles-based concept-level structural mass estimating for surface ships*

Li Chen *Investigation of T.S.S.* Bermagui

Georgia McLinden *Swimming Techniques and Flow Control of Seals*

Thomas van Peteghem *Improving Traditional Fishing Vessels in Developing Countries*

RINA–Austal Ships Award

RINA and Austal Ships jointly offered an award of $500 and a certificate for the best presentation at the conference by a student member on a naval architectural project. Assessment was made on the basis of marks awarded by School staff. The award went to Georgia McLinden her presentation on *Swimming Techniques and Flow Control of Seals*. The certificate and cheque have both arrived, and were presented by Naval Architecture Stream Coordinator, Phil Helmore, at the Naval Architects' Annual Lunch on 20 November. Congratulations, Georgia!

Phil Helmore presenting the RINA-Austal Ships Award to Georgia McLinden (Photo courtesy Lawry Doctors)

Naval Architects' Annual Lunch

With the passing into history of the Thesis Conference Dinner, the inaugural Naval Architects' Annual Dinner was held last year for the final-year naval architects. This year the Naval Architects' Annual Lunch was held on 20 November at Giovanna's Italian Restaurant in Kingsford, and was attended by the entire final-year cohort along with Lawry Doctors, Mac Chowdhury and Phil Helmore.

Naval architects enjoying their Annual Lunch (Photo courtesy Giovanna's Restaurant)

Scholarships

The Austal-UNSW Endowment Scholarship is offered by UNSW to students in Year 3 of a four-year naval architecture degree program. The scholarship is valued at $8500 per year for two years and includes one industry placement with Austal Ships. The award aims to attract naval architecture students to a career with Austal Ships. Applicants are assessed on academic merit and a variety of key personal qualities and skills. The current holder of the Austal-UNSW Endowment Scholarship is Georgia McLinden in Year 4.

The Civilian Defence Engineering Scholarship is offered by the Department of Defence to students in Year 2 of a four-year naval architecture degree program. The scholarship is valued at $12 000 per year for three years, and includes two 12-week industry placements with the Department of Defence. The award aims to attract engineering students to an Australian Public Service career with the Department of Defence. Applicants are assessed on academic merit and a variety of key personal qualities and skills and they receive professional mentoring for the life of the scholarship. The current holders of the CDE Scholarship are James Heydon in Year 3, and Alistair Smith in Year 2.

The Roads and Maritime Services Undergraduate Engineering Scholarship is offered by NSW Roads and Maritime Services to students in Year 2 of a four-year naval architecture degree program. The scholarship is valued at $15 250 per year for three years and includes two 12-week industry placements with RMS. The award aims to attract naval architecture students to a career with NSW RMS. Applicants are assessed on academic merit and a variety of key personal qualities and skills. The holder of the inaugural RMS Undergraduate Engineering Scholarship is Bryce Waters in Year 2.

Graduation Ceremony

At the graduation ceremony on 6 November, the following graduated with a degree in naval architecture:

Yasuhiro Hayashi Honours Class 1

He is now evaluating opportunities. Congratulations, Yasu!

Thesis Projects

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

Improving Traditional Fishing Vessels in Developing Countries

Traditional fishing vessels in developing countries tend to continue to be built along traditional lines, using traditional materials, and can benefit from design and construction improvements. Thomas van Peteghem investigated the stability, resistance and structure of the traditional 15 m pirogue which is used for purse-seine fishing in Senegal, West Africa. The traditional timber structure was replaced with a composite structure comprising locally-available jute fibre which could be laid up by hand to provide a lighter structure of strength equal to that of timber. This provided an increase in the available deadweight (including better conditions for preservation of the catch), while an increase in beam provided a useful increase in stability at the expense of a marginal penalty in resistance at the usual displacement speed.

Swimming Techniques and Flow Control of Seals

The two main superfamilies of pinnipeds, phocids (the earless or "true" seals) and otariids (the eared seals: sea lions and fur seals), have evolved in different ways to adapt to different environments, food sources and reproductive habits, and this has been well documented qualitatively. The fur seal is an otariid, but the leopard seal and Weddell seal are phocids. It's an important differentiation because phocids swim with their hind flippers and otariids with their fore-flippers. An interesting point to note is that even though biologically the leopard seal is a phocid, its flipper location is more similar to that of an otariid.

Georgia McLinden undertook a comparison between three species of pinnipeds with varying anatomies to model the forces on each body when gliding with fore-flippers at the side and when swimming with fore-flippers outstretched. A fur seal, leopard seal and Weddell seal were represented by three-dimensional CAD models and computational fluid dynamics was used to identify the drag forces on each body with and without flippers attached. Validation was carried out from measurements made on an ellipsoid in a wind tunnel and video footage taken at Taronga Zoo. The greatest drag coefficient was found for fur seals. The effect of flipper extension was found to be greatest for leopard seals, which require quick course-changing manoeuvrability. The smallest drag coefficient for gliding without flippers was found for the Weddell seals, which undertake more-extensive diving. Generally, the location of the fore-flippers on the body had the most influence on the manoeuvrability and drag, while the swimming technique the most effect on the lift. The findings suggest that hydrodynamics mirrors biological imperatives for swimming techniques.

Post-graduate and Other News

Construction Progress

Refurbishment of the Mechanical Engineering buildings is now fully underway. Richard Crooks Constructions (RCC), the prime contractor, has now started work on the southern half of the Willis Annex (the laboratory building). When that work is completed in mid-2014, most of the laboratories in the northern end of the Willis Annex will decant into the southern end and work will commence on the northern half. RCC has also now started work on most of the floors of the link wing between the main Mechanical Engineering building and the Computer Science and Engineering building.

The School Office has relocated to the fourth floor of the north wing of the Electrical Engineering building, along with the Engineering Student Centre. All of the School's academic staff have relocated to their interim locations on Level 4 of the Electrical Engineering building (this is where the naval architects are), Level 3 of the Tyree Building, and the Ground Floor of the Library Building. The most accurate source of information on where to find a staff member is at www.mech.unsw.edu.au/info-about/contact-us/staff-database.

The teaching laboratories that we used in the SIRF building in 2013 were handed back to the university at the end of this semester and our teaching laboratories will be relocated to LG09 and LG10 in the Tyree Building. The Mechatronics teaching laboratory is located on the Ground Floor of the Blockhouse. The computer laboratories in the Mechanical Engineering building will closed in November, with limited computer facilities provided in the Tyree Building for thesis students and other students working over the summer break, until our full interim computer labs are opened in the Tyree Building in February 2014.

Classes will continue as normal during 2014 as per the published university timetable.

During the refurbishment, you can view all the work on both buildings on two webcams:

http://129.94.82.79//view/viewer_index.shtml?id=129

and

http://129.94.82.79/view/viewer_index.shtml?id=43

And then we start 2015 in two refurbished buildings, with a 350 seat theatre, all our CATS rooms in our own building, a 200-seat computer laboratory, and all-new Willis laboratories, etc.!

Phil Helmore

INDUSTRY NEWS

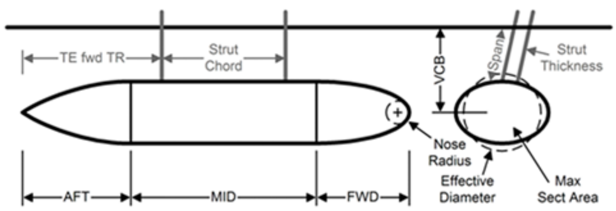
New Submarine and SWATH Capabilities for HydroComp NavCad®

HydroComp NavCad is a software tool for the prediction and analysis of vessel speed and power performance. It also provides for the selection of suitable propulsion system components — engines, gears and propellers.

A recent development effort has been undertaken to provide new submarine and SWATH performance analysis in NavCad. This includes new definitions for submerged hullform geometry and the prediction of resistance and hull-propulsor interaction coefficients.

Submerged Hullform Geometry

The definition of the submerged hulls of submarines and SWATH vessels in NavCad is a new treatment of traditional parametric descriptions of "body-of-revolution" submarine hulls. The traditional parametric data has been expanded to provide for non-cylindrical sections as well as increased detail of nose geometry. It also includes definition of single-strut geometry suitable for SWATH vessels.



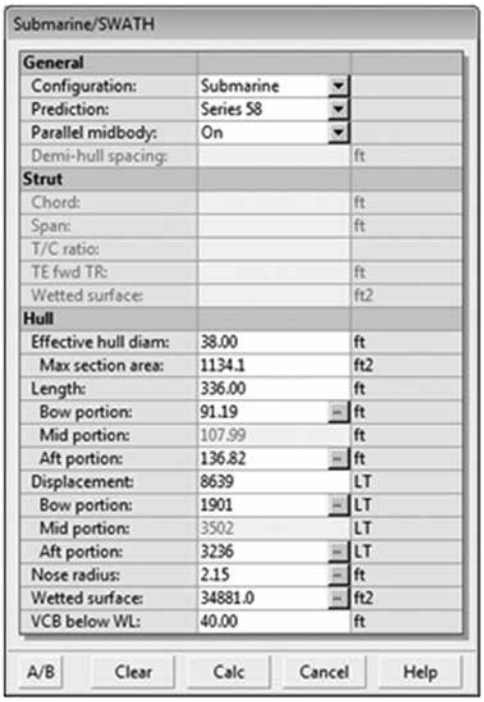
Definition of hull and strut geometry
(Image courtesy HydroComp)

Resistance prediction

NavCad now provides the user with three different resistance prediction methods for bare-hull drag — a SWATH-specific algorithm and two submarine-derived prediction methods. One of the submarine methods is based on HydroComp's recent reanalysis of the Series 58 tests (including the extended "parallel mid-body series"). Ongoing HydroComp research on submarine resistance includes a study for added wave-making resistance when running at shallow depth. Added resistance for appendages will leverage NavCad's existing prediction functions.

Data entry and process

The standard framework for NavCad is built around surface vessels which follow prescribed prediction methodologies. The submarine/SWATH predictions are treated as supplemental calculations which are "defined" outside of the standard framework. The appropriate performance results array will be calculated and locked, and the prediction method identified in the "Defined" caption.



The data entry table and process buttons
(Image courtesy HydroComp)

Summary

This new extension for NavCad is the first of a number of focussed "modules" for the standard prediction framework. On-going module development for similar new capabilities includes re-analysis of barge-train resistance and new hybrid wave-making codes. The new submarine/SWATH features are available immediately to all NavCad customers with an active update subscription.

UK Ministry of Defence Extends Contract with BMT

BMT Hi-Q Sigma Ltd, a subsidiary of BMT Group, has announced that, in partnership with Nuvia Ltd, it has been awarded a 12-month extension contract with the UK's Ministry of Defence (MoD). This contract will see both companies continuing to provide technical expertise and programme management support for the submarine dismantling project (SDP). Nuvia is a nuclear specialist, operating across the complete lifecycle from new build to final decommissioning and waste management.

The SDP, which was introduced to help develop a solution for the dismantling of the UK's nuclear submarines after they have left service with the Royal Navy, was recently given the green light to move forward to the next main phase.

Working on the project for the last four years, BMT has helped the SDP to build confidence with stakeholders and be recognised for key achievements. BMT will continue to work closely with the MoD team in this phase, helping to define a programme which recognises and attains the required outcomes, as well as providing hands-on risk, schedule, interface and change-management support at the project level.

Simon Gould, Managing Director of BMT Hi-Q Sigma, commented “Controlling an increasingly-complex and diverse requirement and managing a dispersed team is no mean feat. By working in partnership with the MoD, we are providing clarity and ensuring that issues, opportunities and risks are effectively managed.”

Decommissioned RN nuclear submarines laid up at Rosyth awaiting disposal
(Photo courtesy BMT)

Award for Incat Tasmania

Incat Tasmania has won the Manufacturer of the Year award in the 2013 Tasmanian Export Awards, recognising the significant innovation in the design and construction of *Francisco*, the world’s first high-speed ro-ro ferry to use LNG as its primary fuel.

The Manufacturer of the Year award was announced at a ceremony in Hobart on 11 October and Incat will now progress to the Australian Export Award finals, with the national winner set to be announced in late November.

Kim Clifford, Managing Director of Incat Marketing Pty Ltd receives the Tasmanian Export Award for Manufacturing from Geoff Atkinson, State Manager (Tasmania) for AusIndustry
(Photo courtesy Incat Tasmania)

BAE Systems Restructures Naval Sector

In November BAE Systems announced that it had reached agreement in principle with the UK Government on measures to enable the implementation of a restructuring of its UK naval ships business. The agreement will result in the restructuring of the contract for the Queen Elizabeth-class aircraft carrier program, provision of additional shipbuilding work prior to the start of the Type 26 global combat ships program, and rationalisation of the UK naval ship business to match future capacity requirements.

In 2009, BAE Systems entered into a Terms of Business Agreement (ToBA) with the Ministry of Defence which provided an overarching framework for significant naval shipbuilding efficiency improvements in exchange for commitments to fund rationalisation and sustainment of capability in the sector. The agreements announced in November, together with an anticipated contract for the design and construction of the Type 26 global combat ships, will progressively replace the ToBA.

Queen Elizabeth-class Aircraft Carrier

BAE Systems, with the other participants in the Aircraft Carrier Alliance, has agreed changes to the Queen Elizabeth-class aircraft carrier contract. Under the revised terms, the contract will be amended to accommodate program changes and activities previously excluded from the contract.

Under the new target cost contract the industrial participants’ fee will move to a 50:50 risk-share arrangement providing greater cost-performance incentives. The maximum risk to the industrial participants will continue to be limited to the loss of their profit opportunity.

The revised contract reflects the increased maturity of the program, with structural assembly of the first-of-class vessel now substantially complete.

Interim Shipbuilding Workload

A significant reduction in workload will follow the peak of activity on the aircraft carrier program, the six Type 45 destroyers and two export contracts. The anticipated Type 26 program will, in future years, address some of that workload reduction. In the interim period, a proposed contract for the construction of three offshore patrol vessels will provide additional capability for the Royal Navy and sustain key shipbuilding skills.

Restructuring of the Naval Shipbuilding Business

Following detailed discussions about how best to sustain the long-term capability to deliver complex warships, BAE Systems has agreed with the UK Ministry of Defence that Glasgow would be the most-effective location for the manufacture of the future Type 26 ships. Consequently, and subject to consultation with trade union representatives, the company proposes to consolidate its shipbuilding operations in Glasgow with investments in facilities to create a world-class capability, positioning it to deliver an affordable Type 26 program for the Royal Navy.

Under these proposals, shipbuilding operations at Portsmouth will cease in the second half of 2014. Subject to consultation, Lower Block 05 and Upper Blocks 07 and 14 of the second Queen Elizabeth-class aircraft carrier will be allocated to Glasgow.

The company remains committed to continued investment in the Portsmouth area as the centre of its maritime services and high-end naval equipment and combat systems business.

Consultation will commence on a total employee reduction of 1775 which is expected to result from these restructuring proposals, including 940 in Portsmouth in 2014 and 835 across Filton, Glasgow and Rosyth progressively through to 2016.

The cost of the restructuring will be borne by the Ministry of Defence.

The implementation of these restructuring activities will sustain BAE Systems' capability to deliver complex warships for the Royal Navy and secure the employment of thousands of highly-skilled employees across the UK.

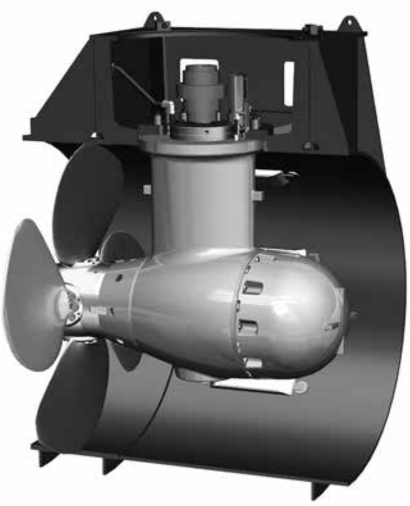
Wärtsilä Introduces Next Generation Thruster Portfolio

Wärtsilä has introducd a new series of both steerable and transverse thrusters which will further develop the current portfolio. The new Wärtsilä Steerable Thruster series (WST) is being introduced to replace the company's Modular Thruster and Compact Thruster series, while the new Wärtsilä Transverse Thruster series (WTT) is replacing the current range of transverse thrusters. The new products have been developed in response to changing market demands, requiring competitive thruster products which are more efficient and cover a wider power range.

This major product development project was launched by Wärtsilä's Propulsion R&D in 2011. The latest insights in thruster design were implemented using state-of-the-art numerical simulation tools. The first product to enter the pilot phase is a 4500 kW underwater (de)-mountable steerable thruster, the WST-45-U, which began its pilot phase in summer 2013. Two more products, the WST-14 and the WTT-11, are scheduled to begin their pilot phases before the end of this year. Wärtsilä will continue the introduction of different sizes of thrusters in the coming years based on market requirements and customer priorities.

The new thrusters are available for various types of vessel depending on the size and features of the product. For example, the WST-45-U is designed mainly for the offshore drilling market; the WST-14 is intended for tugs up to 45 t bollard pull, inland waterway vessels, and for river/sea going cargo ships. This thruster is compatible with both medium-speed and high-speed (1800 rpm) diesel engines. The WTT-11 is a 1100 kW tunnel thruster designed mainly for merchant cargo vessels.

The WST 45 thruster
(Image courtesy Wärtsilä)



The WTT 11 thruster
(Image courtesy Wärtsilä)

The WST 14 thruster
(Image courtesy Wärtsilä)

The new WST and WTT units come with several added features, such as an increased power range, an 8° tilted propeller gearbox, and a new Wärtsilä Thruster nozzle for the thrusters designed for offshore drilling. The new thrusters intended for tug applications also have the new nozzle which improves performance and has a high level of system integration as well. The new tunnel thrusters are more compact and more efficient than earlier versions.

"The marine sector is undergoing a period of significant change and technological advancement, and this next-generation Wärtsilä thruster portfolio has been developed in line with these trends by utilising the latest calculation tools and model testing to secure the hydrodynamic leadership of the products. The new products are even more efficient and reliable than earlier, as well as being lighter and easier to install," said Mr Arto Lehtinen, Vice President Propulsion, Wärtsilä Ship Power.

Qinetiq Software to Support Development of Tidal Energy Industry Vessel

Paramarine software has been selected by Mojo Maritime Ltd to support the design of a new dynamic-positioning offshore construction vessel, the HF4, which will have applications for the tidal energy industry. Mojo Maritime specialises in marine operations, technical consultancy and project management for the offshore renewable-energy sector.

The purpose of the HF4 is to reduce the installed cost of marine renewable-energy devices to initiate industrialisation. The vessel is designed to operate using dynamic positioning in currents up to 10 kn, allowing a high degree of accessibility and improved productivity during the construction phases of tidal-energy farms. It is capable of installing foundations, cables, subsea connectors and turbines in a wide range of conditions. The development of the vessel is being assisted by the Technology Strategy Board and the Mojo lead consortium involving Voith, DNV, Bauer and the University of Exeter. Construction is planned to begin in 2014.

"We selected Paramarine because of its extensive functionality and track record in the offshore renewables industry. The parametric nature of Paramarine and its ability to handle novel-shaped offshore structures means that it is very useful for concept design. In addition, the probabilistic damage stability analysis is necessary for the design of special-purpose ships as employed in offshore construction where technical construction teams are working on vessels," said Simon Hindley, Naval Architect, Mojo Maritime.

Mojo Maritime will be using the probabilistic damage analysis module, one of a number of new capabilities in the latest version of QinetiQ GRC's Paramarine software, V8, which takes into account not only the vessel's stability when certain subdivisions of the ship are damaged but assigns probabilities to various extents of damage and survivability when damaged. This is required as part of the design for all passenger and cargo vessels.

"We are very excited about the selection of Paramarine software by Mojo Maritime and their use of our software to support the design of such an innovative vessel. The dynamic marine renewable-energy sector represents one of our fastest-growing markets today," commented Vittorio Vagliani, Managing Director, QinetiQ GRC.

Wärtsilä Launches New Long-life Seal Ring

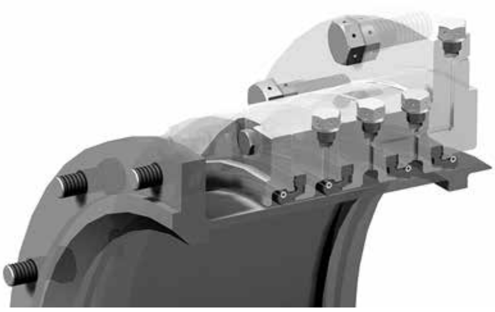
Wärtsilä has launched its new Bio Seal Ring(TM) product for maritime stern-tube seal applications. The Wärtsilä Bio Seal Ring is the first seal on the market which works with Environmentally Acceptable Lubricants (EAL), sometimes known as bio-degradable oils, for a lifetime of at least five years. Conventional seal rings are recommended to be changed at two-and-a-half year intervals.

The benefits offered by the Wärtsilä Bio Seal Ring to ship owners and operators are both environmental and economic. The extended operating life expectancy has a significantly positive impact on dry-dock scheduling and related costs. The unique features of the Wärtsilä Bio Seal Ring have been achieved through improvements in the material formula by including new additives. The product has been tested extensively and proven in the Wärtsilä Seals and Bearings R&D facility.

This solution is suited to fixed-pitched propeller systems. Wärtsilä recommends that ship owners consult with the propulsion original equipment manufacturers to confirm EAL compatibility for controllable-pitch propeller systems.

The new product enables compliance with the US Environmental Protection Agency's (EPA) Vessel General Permit 2013 legislation which comes into force on 19 December 2013. From this date, all commercial vessels over 24 m in length operating in US waters will be required to use EALs in all oil-to-water interfaces unless deemed technically infeasible to do so. At least 10–20 % of all merchant vessels in the world operate in US waters.

In addition to new shipbuilding applications, the Wärtsilä Bio Seal Ring can also be retrofitted to existing vessels. The first deliveries of the product took place in October of this year.



The Wärtsilä Bio Seal Ring
(Image courtesy Wärtsilä)

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 150 dpi. A resolution of 300 dpi is preferred.

Australian Division Council

I have to record at the outset of this report the passing on 15 November of the Division's previous Secretary, Keith Adams, after a long battle with cancer. While Keith served the Division with distinction from 1995 to 2009, he was a very private person and, until his funeral on 21 November, I for one, had heard only snippets of his previous distinguished work in microbiological research, the Naval Reserve and in the public administration of maritime research. I understand that a full tribute to him will be published in the next issue of this journal. Our condolences are extended to Keith's widow, Shirley, and his family.

The Council of the Australian Division of RINA met on Wednesday 18 September 2013 by teleconference based in Perth and chaired by the Vice President, Dr Tony Armstrong. Some of the matters raised or discussed during the meeting are outlined as follows:

BPEQ Definition of Engineering Work

A paper outlining the issues from RINA's perspective regarding the present exclusion of "Code" implementation would be prepared by a group headed by the Vice President, for consideration by the forthcoming meeting of the naval architecture Joint Board.

Future Demand for Naval Architects of all types in the Naval Sector

Council agreed that a letter should be sent to the new Government expressing concern at the "boom and bust" pattern of naval architecture skills demand as reflected in the Future Submarine Industry Skills Plan.

Council also received a report on work that had been commenced with Manufacturing Skills Australia regarding preliminary work for the establishment of vocational naval architecture courses following the closure of the TAFE NSW Ultimo courses.

Implementation of Single National Jurisdiction

The Secretary noted that a number of problems with the legislation had been identified following its entry into force on 1 July and these were being worked through as quickly as possible.

Members' input to the revision of NSCV standards would be welcomed and should also be forwarded to the Secretary.

The Walter Atkinson Award 2013

Council approved the WAA Committee's recommendation that this year's award be made to Ross Ballantyne, Gregor Macfarlane, Stuart Ballantyne and Tim Lilienthal for their paper *The Floating Harbour Transhipper — an Operationally Effective Solution for Military and Emergency Response Duties*", presented at the Pacific 2012 IMC.

Pacific 2013 International Maritime Conference

Council noted final preparations for Pacific 2013.

London Council Issues

The Division Council was briefed on the main issues covered by the Institution's July Council meeting.

Next Meeting

The next meeting of the Australian Division Council will be held on Thursday 5 December 2013 in Sydney.

Rob Gehling

The Walter Atkinson Award

At the Cocktail Party for the Pacific 2013 International Maritime Conference, the Secretary of the Australian Division of RINA, Rob Gehling, announced the winner of the Walter Atkinson Award for 2013. For the younger members of the tribe, some background to the award may be useful.

The Man

Walter Atkinson was a Geordie who arrived in Australia with a solid background in shipbuilding from the Tyneside in Newcastle, UK. He spent time as the Hull Overseer at Cockatoo Island Dockyard, and at Navy Office in Melbourne. He finished up as Superintending Naval Architect at HMA Naval Dockyard, Garden Island, and was still employed there when he died after a short illness in 1970. He was a founding member of the Australian Branch (as it was then) of the Royal Institution of Naval Architects, and a long-serving member of council. He was widely respected for his "people skills" and for his practical shipbuilding knowledge.

The Award

To perpetuate his memory, the Council of the Australian Branch resolved in 1971 to present a Walter Atkinson Award, annually at its discretion, to a selected paper presented at a meeting of the Institution in Australia. The object of the award was

"to stimulate increased interest in the preparation, and to raise the standard, of technical papers presented by members to the Institution."

The award was originally valued at approximately $25.00 and the inaugural presentation, made in 1972, was an impressive painting of the clipper ships *Ariel* and *Taeping* racing under full sail.

In 2002 the RINA Australian Division Council broadened the eligibility for the Award, while adhering as far as possible to its original intent, by changing the object to:

"stimulate increased interest in the preparation and to raise the standard of technical papers presented to the naval architecture community in Australia".

and broadened the eligibility to:

"The nomination may be for a presentation which includes a written technical paper, or for a technical published paper, and it must be more than a promotional presentation. The paper must be first presented at a maritime conference or RINA meeting within Australia, or first published in a maritime journal within Australia, during the current year. All authors are eligible."

Following a review which reported in June 2005, the Australian Division Council confirmed that the Award should be continued essentially unchanged. Specifically, the review rejected increasing the monetary value of the award, broadening the scope to include visual presentations and fields "closely related" to naval architecture, restricting the award to members of the Institution and restructuring the award as a student prize.

In June 2012 Council agreed to the formation of a sub-committee headed by Kim Klaka, assisted by Martin

Renilson and Rob Gehling, tasked with championing the Award. The sub-committee interpreted this as a brief to review the conditions, processes, value and marketing of the award, without straying from the award objectives. Their recommendations were supported by Council at their September 2012 meeting, and are summarised below.

Scope and Eligibility

A nomination must be a written paper, either first presented at a RINA-supported conference in Australia, or first published in a RINA-supported publication in Australia. Examples include the Pacific conference series, the Innovation in High Speed Vessels conference series, and The Australian Naval Architect journal. A paper presented at a Section meeting is eligible provided it is accompanied by a written copy of the paper submitted to the Section (or Division).

Papers by multiple authors are eligible and all authors are eligible—Australian or overseas, members or non-members. This aspect was subject of much discussion at the Council's September meeting. One of the reasons for allowing this broad spectrum of eligibility is that many papers these days have multiple authors, making it difficult and limiting to weed out non-Australians and non-members. Council agreed to proceed with this eligibility recommendation but to monitor the results over the next two years.

Members of the Award sub-committee are not eligible.

For most years, nominations will be for papers published in the year 1 July to 30 June. However, for this immediate next Award, nominations will be received for papers published in the extended period 1 January 2012 to 30 June 2013. This extended allows for consideration of Pacific 2012 papers.

Selection Criteria

A maximum of 10 points are allocated to each of:

- Is there a stated or implied purpose?
- How important is the paper to Australia?
- Does the paper have any new ideas to impart?
- How easy is the paper to understand?
- How rigorous is the paper?

If no paper scores more than 35 points average out of 50 maximum, then the prize will not be awarded. Having a points system offers consistency across reviewers, and the criteria chosen reflect the original objectives of the Award.

Selection Process

Nominations will be received from three sources:

- Section committees: each Section will be invited to nominate up to *two* papers;
- RINA supported Australian conference committees: each conference committee will be invited to nominate up to *three* papers;
- RINA Council (or a delegated sub-committee) will be invited to nominate *one* paper from the *Australian Naval Architect*.

A Section can nominate a paper from any eligible source, they are not limited to a Section paper.

It was felt that a compromise had to be reached between the need to encourage papers from several sources, whilst keeping numbers manageable for the Award committee. The September meeting of Council debated these nomination restrictions and agreed to monitor them over the next couple of years.

A Council-appointed award committee of three RINA members will receive the nominations and make a recommendation to Council for the best paper. The Award committee members are not eligible for the Award.

Award Value

The Award will comprise three components:

- an engraved trophy or medal;
- a framed certificate for each author; and
- where practicable, a free registration/entry to the event at which the award is to be presented.

Award Presentation

The Award will be presented by the President of the Australian Division (or their nominee). It will be presented at the next RINA-supported conference in Australia. Where this is not practical, the Award may be presented at a Section or Divisional event.

Ideally we would like to make the presentation at an annual RINA event but there is no truly national one. This highlights the need for an annual national RINA social event, possibly linked with a national conference when appropriate.

So the event at which the Award is presented will vary from year to year. It will be a high-profile event, but not so long after Award closing date that it becomes lost in time.

Timeline

Nominations may be received at any time during the 12 month eligibility period. Nominations will close on 15 July. The Award committee will make its recommendation to the September meeting of Council and the Award will be announced in October.

With the main conference season being December- March, a financial year allows for streamlined selection of the winner in time for presentation at a suitable event. It also avoids the interruption of the Christmas close-down period.

For further details of the Walter Atkinson Award, visit www.rina.org.uk/prizes_and_awards.html.

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
Aust. Division		rina.austdiv@optusnet.com.au
Section	ACT	rinaact@gmail.com
	NSW	rinansw@gmail.com
	Qld	peter@directmarinesolutions.com.au
	SA/NT	danielle.hodge@defence.gov.au
	Tas	mfsymes@amc.edu.au
	Vic	srkelly@globalskm.com
	WA	rina.westaus@gmail.com

Phil Helmore

RECOGNITION FOR BOB CAMPBELL

Sixty-year Membership Certificate

At the Cocktail Party for the Pacific 2013 International Maritime Conference, the Chief Executive of RINA, Trevor Blakeley, presented Bob Campbell with a certificate for his sixty years of membership of RINA. Membership certificates commence at 45 years, are given more rarely at 50, even more rarely at 55 years, and *very* few at 60 years!

Bob did his Bachelor of Science degree in naval architecture at the University of Glasgow, where he and Michael Pearson were in the same classes and were taught by Andrew McCance Robb, author of the famous *Theory of Naval Architecture*, which grew out of his lecture notes; i.e. Bob and Michael were proof-readers for Professor Robb! Bob worked at Barclay Curle in Glasgow, where he was chief draftsman.

He, with his family, migrated to Australia in 1964 when he took up the position of Assistant Superintendent of Hull Design at the Australian Shipbuilding Board. Gordon Clarke was then the Superintendent of Hull Design and Bill Miller was the Naval Architect, who supervised the Superintendents of Hull, Mechanical and Electrical Design. Bill Miller retired in 1967 and Bob was promoted over Gordon Clarke to take Bill's position. This left the Assistant Superintendent's position vacant, and this was filled by Noel Riley in October 1967.

The demise of the Ship Design Group within the ASB began with the passing of the Bounty (Ships) Act of 1980 which changed the role of the Board. The SDG was then operated within the Department of Industry, Technology and Commerce until it was taken over by Cockatoo Dockyard in reduced form in September 1981. The unit was renamed the Ship Technology Unit and Bob took up the position of Chief Executive, with the consultancy providing hydrostatic, trim, stability and flooding calculations for clients, new designs, evaluating structural strength of existing ships for carriage of heavier cargoes, evaluation of stability for sections of the Sydney Harbour Tunnel (still to be built), and carrying out tests and trials. Bob retired from the STU in 1987 when it was sold to Nigel Offer, who still runs it today.

In retirement, Bob and Marie moved to Kurrajong on the eastern slopes of the Blue Mountains, and have recently re-located to the Cotswolds Retirement Village in North Turramurra.

Bob was accompanied at the presentation by his wife Marie, son Peter and daughter-in-law.

Congratulations, Bob!

Phil Helmore
Noel Riley
John Jeremy
Paul Buzzai

Trevor Blakely and Bob Campbell after the presentation of Bob's sixty-year membership certificate
(Photo John jeremy)

City of Adelaide Coming Home to Adelaide

The clipper ship *City of Adelaide* was built in 1864 by William Pile, Hay and Co. in Sunderland, England, and was launched on 7 May 1864. Between 1864 and 1887 she made 23 annual return voyages, transporting passengers and goods from London and Plymouth to Adelaide. On the return voyages the ship carried passengers, wool and copper from Adelaide and Port Augusta to London. Researchers have estimated that a quarter of a million South Australians can trace their origins to passengers on *City of Adelaide*.

The ship was commissioned into the Royal Navy as HMS *Carrick* between 1923 and 1948 and, after decommissioning, was known as *Carrick* until 2001, when her name reverted to *City of Adelaide*.

After a series of events stemming from a flooding mishap in 1989, ownership passed to the Scottish Maritime Museum and in 1992–93 the ship was moved to a private slipway adjacent to the Scottish Maritime Museum's site in Irvine. A restoration commenced but was halted in 1999 after funding difficulties when Scotland regained its own parliament. After being served with an eviction notice by the owners of the slipway, the Museum applied for permission from North Ayrshire Council to demolish the ship as a listed structure. However, after a study of four options, the Scottish Minister for Culture and External Affairs, Fiona Hyslop, announced that the preferred option was moving the vessel to Adelaide for preservation.

The Adelaide-based, not-for-profit organisation Clipper Ship City of Adelaide Ltd (CSCOAL) has completed a 100 t, $A1 million steel cradle to be placed under the ship to move her. The cradle was designed and built through the community support of two dozen engineering firms across South Australia, from geographically widespread locations including Adelaide, Gawler, Bowhill (on the Murray River), Port Augusta and Port Pirie.

The cradle has been transported to Scotland, and Dutch salvors, HEBO Maritiemservice, have been contracted by CSCOAL to assist with the installation of the cradle beneath the vessel. The vessel has now been jacked a half-metre above her resting place on the Scottish slipway, the cradle installed, and the vessel weighed. These are critical steps in the program for transporting the vessel to Adelaide.

A video of the installation of the cradle beneath the vessel is available on the website

http://cityofadelaide.org.au/our-news/our-news-articles/107-2013-news/804-hebo-corporate-video-27-july-2013.html?goback=.gde_3077992_member_262980620.

A formal renaming ceremony for the ship was held on 18 October in the presence of His Royal Highness The Duke of Edinburgh KG, KT in front of the Old Royal Naval College at Greenwich.

Her voyage to Adelaide began on 20 October, when she departed Greenwich to be loaded onboard the heavy-lift ship MV *Palanpur* in Heysehaven, Rotterdam, Netherlands.

The voyage is likely to adopt the following itinerary:

- Rotterdam, Netherlands
- Norfolk, Virginia, USA
- Cape Town, South Africa (not visiting port)
- Port Hedland, Western Australia
- Dampier, Western Australia (not confirmed)
- Port Adelaide, South Australia

Palanpur, with *City of Adelaide* onboard, is expected to arrive in Port Adelaide between 18 and 30 January 2014.

City of Adelaide is the world's oldest surviving clipper ship, one of only two surviving composite clippers (the other is *Cutty Sark*), one of only three surviving sailing ships (and the only one of these a passenger ship) to have taken emigrants from the British Isles (the other two are *Edwin Fox* and *Star of India*), and the last survivor of the timber trade between North America and the United Kingdom.

For further details of the vessel and her history, visit http://en.wikipedia.org/wiki/City_of_Adelaide_%281864%29.

City of Adelaide leaving Greenwich on 20 October
(Photo courtesy Peter Roberts)

Webcasts of NSW Section Technical Presentations

Engineers Australia records technical presentations made to RINA (NSW Section) and IMarEST (Sydney Branch) for webcasting. The webcasts are placed on the Engineers Australia website, usually within a few days of the presentation.

Elliot Thompson of the Department of Defence gave a presentation on *Application of the IMO's Energy Efficiency Design Index to Naval Vessels* to a joint meeting with the IMarEST attended by 29 on 4 September in the Harricks Auditorium at Engineers Australia, Chatswood. The webcast of the presentation is available at www.mediavisionz.com/ea/2013/easyd/130904-easyd/index.htm#.

The pattern of the URL shows that, if you know the date of the presentation in 2013, then you can access the webcast publicly by setting the date in the format yymmdd and replacing the date in the URL given above. If you want a presentation from an earlier year, then you have to change the year (20yy) in the URL as well.

Mariners' Alerting and Reporting Scheme

The Mariners' Alerting and Reporting Scheme (MARS) is a confidential reporting system run by The Nautical Institute to allow full reporting of accidents (and near misses) without fear of identification or litigation. As a free service to the industry, MARS reports also regularly comprise alerts condensed from official industry sources, so that issues resulting from recent incidents can be efficiently relayed to the mariner on board. With access to the internet from vessels becoming more affordable, the MARS database is a valuable risk-assessment, work-planning, loss-prevention tool and training aid for crew and management.

MARS reports are held in a publicly-accessible database on the Nautical Institute's website, www.nautinst.org/en/forums/mars/index.cfm, and reports can also be made by clicking on a link on the same page.

Phil Helmore

NAVAL ARCHITECTS ON THE MOVE

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

Serap Aksu moved on from the American Bureau of Shipping in Singapore two years ago and she has taken up a position as a naval architect with the Maritime Platforms Division of the Defence Science and Technology Organisation in Melbourne.

Seref Aksu moved on within the Universities of Glasgow and Strathclyde many moons ago and took up a position in their Singapore campus, moved to the University of Newcastle-upon-Tyne's Singapore Campus and then, two years ago, took up a position as a naval architect with the Maritime Platforms Division of the Defence Science and Technology Organisation in Melbourne.

Toby Austin-Fraser has moved on from Bakewell-White Yacht Design and has taken up the position of Vessel Performance Analyst with Maersk Maritime Technology, a division of A.P. Moller-Maersk, in Copenhagen, Denmark.

Sam Baghurst moved on from Oceantech Design many moons ago and, after some time at Gibbs and Cox Australia, has now taken up the position of Lead Naval Architect for Future Submarine Engineering at ASC in Adelaide.

Nick Barratt moved on from Gibbs & Cox many moons ago and, after some time with Azure Naval Architects, Woodside Energy and ONA Engineers, has now taken up a position as a Project Engineer with Fugro-TSM in Perth.

Mitch Carmock has moved on from serving as engineer officer in ships of the Royal Australian Navy and, after some time at Mater Health Services, has taken up the position of Engineering Consultant with Capability Partners Asset Management in Brisbane.

John Donovan moved on from Poseidon International many moons ago and, after some time at Altra Energy, has taken up the position of Vice-President Development Engineering with Sigma Offshore in Aberdeen, Scotland.

Rebecca Dunn has withdrawn from her previous PhD program, has completed short courses in remote sensing and biological networks, and is now enrolled in an honours program in physical oceanography at the Institute of Marine and Antarctic Science at the University of Tasmania in Hobart.

Owen Eckford has moved on from consulting and has taken up the position of Operations Director at the Kowloon Motor Bus Company in Hong Kong.

Violeta Gabrovska moved on from Maritime Safety Queensland many moons ago and, after some time at BAE Systems Australia, has now taken up the position of Principal Engineer–Naval Architect at QinetiQ Australia in Brisbane.

Peter Henry has moved on from the Amphibious and Afloat Support Systems Program Office and has taken up a position with Sypaq Systems contracting to the FFG Systems Program Office at Garden Island in Sydney.

Rick Ives has been working for Nestlé since 1984 when he started in Sydney, and has been in many positions in many places since, including Gympie (Qld), Vevey (Switzerland), Freehold (New Jersey), Manila (Philippines) and Kuala Lumpur (Malaysia). Two years ago he took up the position of General Manager and Head of the Regional Engineering Centre of Nestlé in Kuala Lumpur.

Graham Jacob moved on from Saipem many moons ago and, after some time with International Maritime Consultants, has taken up the position of Marine Warranty Surveyor/Project Manager at London Offshore Consultants in Perth.

Daal Jaffers moved on from Oceanlinx three years ago and has taken up a position as Senior Project Engineer with Nautilus Minerals in Brisbane.

Simon Kelly has moved on from BAE Systems and has taken up the position of Senior Naval Architect with Sinclair Knight Merz in Melbourne.

Bryan Kent has moved on within London Marine Consultants and has taken up the position of Naval Architect in their Singapore office, doubling the number of staff there!

Matthew Laverty has moved on from Burness Corlett Three Quays Australia and has taken up the position of Naval Architect with the Riviera Group in Coomera, Qld.

Mervyn Lepper has completed his MBA degree and has taken up the position of Manager Assets, Administration and Special Projects at the University of the South Pacific in Suva, Fiji.

Wade Limpus moved on from the Department of Defence many moons ago and has taken up the position of Consulting Principal with EML Australia in Sydney.

Adrian MacMillan has moved on within Woodside Energy and has now taken up the position of FLNG Development Team Lead in Perth.

Prof. Farrokh Mistree moved on from the Georgia Institute of Technology four years ago, and has taken up the position of Director of the School of Aerospace and Mechanical Engineering at the University of Oklahoma in Oklahoma City, USA.

Cameron Nilsson-Linne moved on from DOF Subsea many moons ago and, after some time at Arup and ONA Group, has now taken up the position of Project Engineer/Naval Architect with Jeyco in Perth.

Andy Phillips has moved on from Austal Ships and has taken up the position of Naval Architect with McAlpine Marine Design in Fremantle.

Shaun Ritson moved on from McAlpine Marine Design two years ago and has taken up the position of Director and Senior Naval Architect with Naval Architecture and Marine Solutions in Perth. He is also providing measurement services to the 34th America's Cup, including measuring both the AC45s and AC72s, and serving on the interpretive body for the AC72 rule.

Ethan Seah moved on from the Royal Singapore Navy two years ago, and has taken up the position of Project Manager Engineering (Integrated Logistic Support) with Singapore Technologies (Marine) in the area of defence business in Singapore.

Greg Seil has moved on from Sinclair Knight Merz and has taken up a position with Advanced VTOL Technologies in Sydney, contracting to the Defence Science and Technology Organisation.

Warren Smith is on a year's sabbatical leave from the Australian Defence Force Academy and is back working with Prof. Farrokh Mistree at the University of Oklahoma in Oklahoma City, USA; Farrokh supervised Warren's PhD thesis at Georgia Tech. many moons ago.

Hiroki Sunayama has moved on from Austal Ships and has taken up the position of Naval Architect/Marine Warranty Surveyor with Braemar Technical Services (Offshore) in Perth.

Emma Tongue moved on from Austal Ships many moons ago, and has taken up the position of Senior Naval Architect with Crondall Energy Consultants in Perth.

Alistair Verth moved on from North West Bay Ships many moons ago and, after some time with Pacific Jets, PSSL in London, and Tradewind Recruitment, has now taken up the position of Manager—Engineering and Technical with Chandler Macleod in Sydney.

Martin Williams moved on from Australian Defence Industries many moons ago, and took up a position with Thales Australia — Maritime and Aerospace in Newcastle and Garden Island, Sydney.

Dan Wupperman has moved on from ThyssenKrupp Marine Systems in Hamburg and has taken up the position of Naval Architect in the Basic Design Yacht Group with Friedrich Lürssen Werft in Bremen-Vegesack in Germany.

Joon Chee Yew has moved on from Jurong Shipyard and has taken up the position of Engineering Manager with the Floating Systems Business Unit of Larsen and Toubro in Singapore.

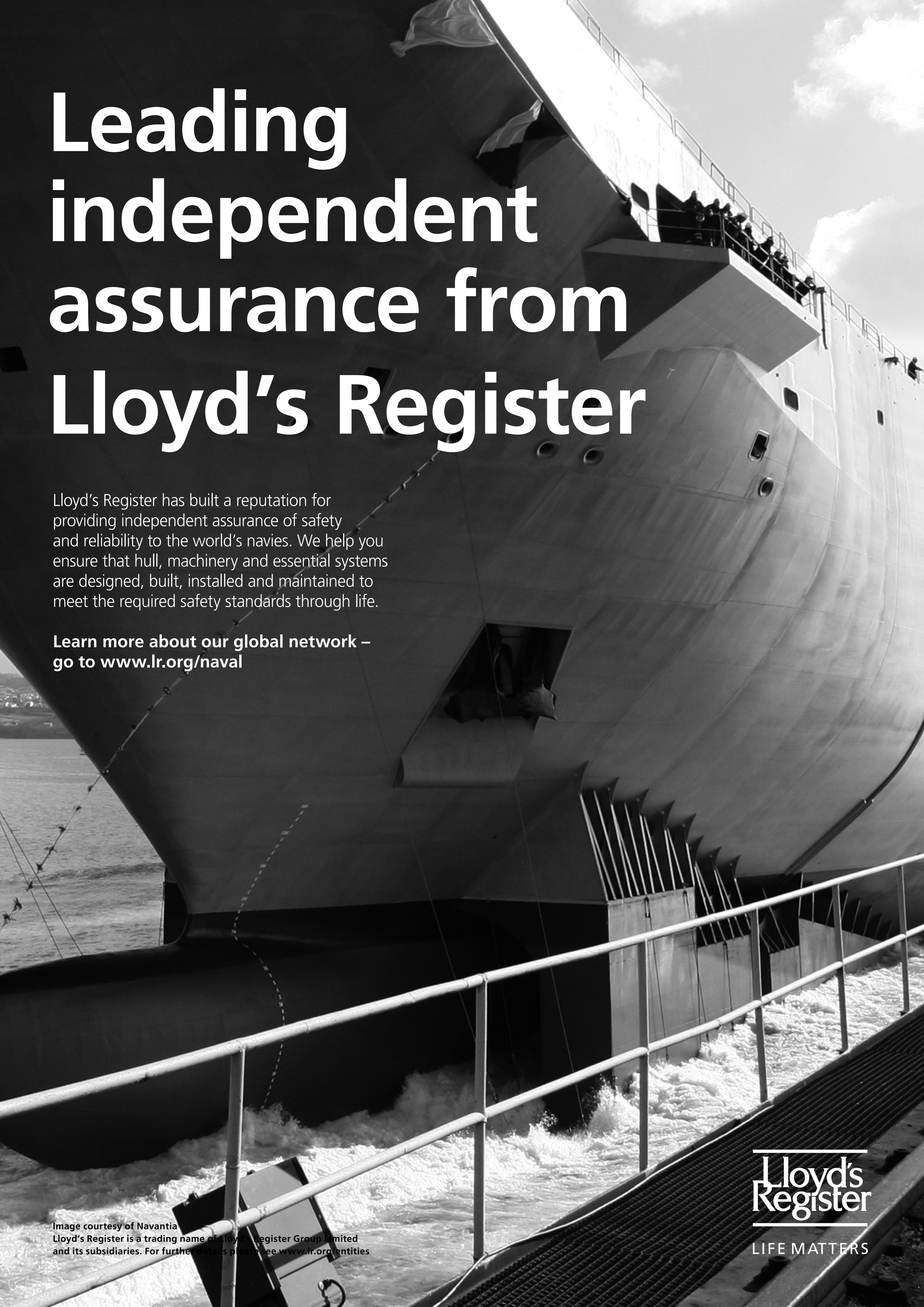
This column is intended to keep everyone (and, in particular, the friends you only see occasionally) updated on where you have moved to. It consequently relies on input from everyone. Please advise the editors when you up-anchor and move on to bigger, better or brighter things, or if you know of a move anyone else has made in the last three months. It would also help if you would advise Robin Gehling when your mailing address changes to reduce the number of copies of *The Australian Naval Architect* emulating boomerangs.

Phil Helmore
Gregor Macfarlane

FROM THE ARCHIVES

HMAS *Stirling* (Fleet Base West) under construction in August 1974. Planning for a naval base on Garden Island in Western Australia began in 1969. Construction began in 1973 and *Stirling* was commissioned on 28 July 1978, finally realising Admiral Henderson's 1911 plan for a major RAN base on the west coast of Australia. Today HMAS *Stirling* is the home base for the Anzac frigates, the RAN's submarines and HMAS *Sirius*, and is an essential part of Australia's defence infrastructure
(Photo John Jeremy)

Built to support the RAN and commercial vessels in WA, the Marine Support Facility (MSF), comprising a shiplift and shore-transfer facility, was constructed at Henderson under a three-way arrangement between the WA government, the Department of Defence and Australian Shipbuilding Industries, later part of Transfield Defence Systems (TDS). It was commissioned in January 1989. In this photograph taken in June 1990 HMAS *Stuart*, the first RAN ship to be permanently based at HMAS *Stirling*, is ashore with *Rig Seismic* on the ship lift. In July 1997 TDS acquired the Commonwealth interest in the shiplift which is now part of the BAE Systems facility at the MSF where the ASMD upgrade for the Anzac-class frigates is being undertaken
(Photo John Jeremy)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Lloyd's Register has built a reputation for providing independent assurance of safety and reliability to the world's navies. We help you ensure that hull, machinery and essential systems are designed, built, installed and maintained to meet the required safety standards through life.
Learn more about our global network – go to www.lr.org/naval
Image courtesy of Navantia
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