THE AUSTRALIAN NAVAL ARCHITECT

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Cover Photo:

The future HMAS *Hobart* taking shape in Adelaide as the last keel module is placed in position
(Photo AWD Alliance)

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From the Division President

I am writing this column having just returned to Australia to find that the election date has been announced and that the Government is in caretaker mode. I sincerely hope that, whatever hue of government we end up with in September, they pay real attention to our education, industry and defence sectors and that they look to the long-term advancement of this clever country. A government that can truly look beyond its next election will always be welcome. Despite this current status, we should all ensure that we never lose an opportunity to lobby for improvements in policy to ensure an appropriate spread of educational opportunities and focus on useful learning — and, of course, on the perennial challenge of continuity of opportunities to ensure skills retention, particularly in the defence sector.

While overseas I managed to be in London for the July RINA Council meeting, the first one to be held in our new headquarters in Northumberland Street. Trevor Blakeley and his team are to be congratulated on this timely acquisition and smooth completion of the relocation. I encourage you to visit them any time you may be passing through London. Apart from the business of this acquisition and relocation, the main focus of the Council in recent months has been the establishment of a Board of Trustees, appointed by Council, to oversee the running of the Institution and to ensure compliance with our obligations as a registered charity. As usual, you can keep yourself informed about these matters via the pages of *RINA News* and brief reports in this journal.

Well, that's the news from headquarters, but what about at your local level? I have not managed to travel as widely within Australia this last year as I would have wished but, from those of you that I have met, I have come away with an impression of mixed feelings about what RINA in Australia is doing for you. We all seem to lead extremely busy and, in many cases, high-pressure lives now. Many of us in work environments of uncertain tenure and, in some cases, of apparently decreasing recognition of the value of professional engineering. The message I get is that you are looking for a clear benefit from your membership; technical topics of specific relevance to your field of employment or which can assist you advancement up the engineering management ladder, such events to take place at times and locations which can fit in with your own tight schedules and budgets. I have also heard concerns expressed that more-relevant support can be found from other professional organisations, such as Engineers Australia and the Society for Underwater Technology. I also see that the Australian Society for Defence Engineering is spreading its wings around the country.

While all this may be true, I would remind you that RINA is recognised as the peak professional body for naval architecture, both internationally and here in Australia. You are all, proudly, naval architects and, if you think that RINA is not doing enough for you, then I would ask whether you are doing enough for RINA. It is through your efforts at the local level that we keep the Institution relevant. I would ask each and every one of you to seriously consider how you can best participate in the enhancement of the Institution's activities in Australia and in the raising of the profile of engineers in general, and naval architects in particular. If there are no suitable, relevant, meetings in your area then let's start them; if your local section is struggling, then please assist them; if there are competing interests from other organisations, then let's meet and work with them; if less experienced colleagues require direction, then let's mentor them; if you see forums which could benefit from engineering expertise, then help us provide it — I could go on. But please, one way or another, get involved — you will be the winner.

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

Jim Black
President, Australian Division

Editorial

The first week in October in Sydney promises to be rather busy with the International Fleet Review, the Pacific 2013 International Maritime Exposition, the RAN Sea Power Conference and our Pacific 2013 International Maritime Conference. The latter has developed into a major international conference and is a highlight of RINA activity in Australia. This time we brought it forward from the usual dates to coincide with the IFR and associated activities.

The IMC could not happen without the efforts of many people. The members of the Organising Committee representing the Institutions sponsoring the conference, the Program Committee members under the leadership of Adrian Broadbent, the referees and, of course, the authors of the papers presented at the conference. Maritime Australia Limited, the organisers of the International Maritime Exposition, provides generous support without which we could not conduct such a high-profile event every two years.

The Pacific 2013 IMC has an excellent program and should not be missed — if you haven't registered yet then do it now!

I look forward to seeing as many RINA members as possible in Sydney during a week which should be particularly memorable.

John Jeremy

LETTERS TO THE EDITOR

Dear Sir,

With the 34th America's Cup due to take place from July through September this year, I'm writing to express my awe of the technology that will be used. The wing-sailed AC72s are expected to be fully foiling which, in itself, is mind-blowing — these catamarans are powerful enough not only to generate sufficient speed to foil, but also to continue foiling through manoeuvres.

For me however, it is all about the wing. Wing-sailed vessels are not new, but I believe the use of them in this America's Cup has led to significant improvements in the understanding of the design and operation of wing sails. The major advantage of the wing sail is that they are more efficient than a conventional sail, which translates into better performance. We are already seeing wing technology from the America's Cup filtering down to centreboard and off-the-beach boats, with designs being tested in catamarans (A-class and F18s) and even smaller boats such as the Optimist. I look forward to watching wings enter the centreboard racing arena, and I strongly believe that they will be welcomed as the next step forward for small boat sailing.

The primary difficulty with wing sails is that they can be unmanageable and difficult to handle on bigger boats, with lowering/raising of the wing becoming a complicated issue. For this reason, I think that the technology will be slower to filter into the yachting arena. However, I have been pleasantly surprised by the discovery of a newly-developed system which makes a wing lowerable and even able to be reefed. The Onesails Omer and Ori Wing Sail Systems (see www.onesails.com/wingsails.php) is an ingenious solution to the problems of wing sails, and I hope that it will be developed further into a larger scale and enter the yachting world.

Wing sails will be the future, and I hope the future flies!

Cameron Edwards
UNSW Student

Dear Sir,

Since I was ten, I have had the dream of studying naval architecture. Seeing such massive bodies floating in water while I was growing up fascinated me, to the extent that I eventually decided to enrol at UNSW to pursue my dream. The shipbuilding industry has been with us since the medieval period and, since then, has grown enormously. This industry has not only made the world a global village but has also been effective in solving problems such as transportation of food and fuel. Even though a lot of work and research has been put into this field over the past few centuries, there is still an enormous scope for research and development, mostly because of growing modern technology. I personally believe that the industry will develop twice as much in the coming years in terms of standards as it has developed over the last few centuries.

One of the first ships which I came across as a child was the legendary British luxury liner RMS *Titanic.* I believe that she was an engineering marvel of the time, and included many innovations. When launched in 1912 she was the largest and fastest ship of the time [*actually not the fastest* — Lusitania *and* Mauretania *could achieve 24 kn compared to* Titanic's *maximum of about 21.75 kn* — Ed.] and eventually went through one of the most tragic accidents in ship history. She sank after hitting an iceberg on her maiden voyage. There were nearly 2200 people on board and, due to a lack of life boats, nearly 1500 of them drowned. The *Titanic* tragedy actually gave birth to the SOLAS (safety of life at sea) requirements which have reduced losses of life due to sea-related accidents.

The marine industry will face many more challenges in the coming years, ranging from fuel scarcity to pollution control. It wouldn't be wrong to say that the world would have been an entirely different place if the marine industry did not exist at all.

Pranjal Gupta
UNSW Student

Dear Sir,

I am interested in hydrofoil-equipped watercraft which were considered the earliest high speed craft (HSC) and were popular in the 1960s and 70s.

The basic principle behind the hydrofoil is similar to that of the airfoil, with both creating lift in identical ways. As the boat increases speed, the hydrofoil elements below the hull deflect the flow of water downward, creating an upward force according to Newton's Law. This upward force lifts the boat out of the water, causing a significant reduction in drag and, hence, increasing the speed. Surface-piercing hydrofoils (V-shaped) were most commonly used on early hydrofoils, while fully-submerged (T-shaped) foils are used on modern hydrofoils. T-shaped foils are more resistant to the effects of wave action, therefore providing more stability at sea and more comfort for a passenger vessel.

Due to its high-speed feature, hydrofoils are often used on passenger vessels. The PT20, PT50, PT100 and PT150 were among the hydrofoils designed by the Supramar company back in the 1950s and 1960s. Hydrofoils were also used for military applications during World War II. On the other hand, hydrofoils are popular among sports and sailing industries. *L'Hydroptère*; the French hydrofoil-equipped trimaran, set a new sail-craft world speed record in 2009 with a speed of 51.36 kn (95.12 km/h) over a 500 m course.

After the 1970s, the use of hydrofoils has been decreasing for a number of reasons. Hydrofoils are sensitive to damage from wave impact or floating objects. Besides that, the sharp edges of the hydrofoils are dangerous to marine life, for example sea-lions and whales. Due to its complex structure and the technology involved, hydrofoils are expensive to build and to maintain.

Despite these disadvantages, I consider hydrofoil technology to be a masterpiece of innovation and should be improved for better use in the future.

Syahmi Hashim
UNSW Student

Dear Sir,

I would like to comment on the importance of environmental concerns in ship design and construction.

Although the shipping industry is generally not scrutinised by consumers, and so not as susceptible to the whims of public opinion as others are, and although the pressure on us may not currently be as strong, we have to understand that that will change in the future.

I recently attended a presentation by a senior executive of a well-known naval architecture firm, and was quite shocked when he made comments which gave the impression that he considered environmental issues to be little more than a joke — an inconsequential hurdle needlessly created by other people that he and his company simply had to appear to be clearing. I believe that that way of thinking is irresponsible and unsustainable.

There are many exciting new (and old) green technologies being used in ship design, such as solar-powered vessels, cargo vessels with either wing- or para-sails to reduce fuel consumption, and smaller improvements such as water-lubricated bearings, but none of these can be considered mainstream. Naval architecture innovates relatively slowly, but there are some changes which need to be embraced and accepted much faster than usual for shipping to keep pace with environmental concerns.

Many naval architects, and certainly most people responsible for the decisions for purchasing vessels, are not generally from a generation which has grown up with environmental impact always at least in the backs of their minds but, fortunately, that will change over time. Hopefully, this will be quickly enough to avoid the sudden and difficult transition from "pre-green" to "post-green" which industries such as the automotive industry are currently experiencing. Being green is something that should matter a great deal to all of us, not just for the sake of ourselves and our descendants, but also for the future security of our industry and individual businesses.

Fergus Hudson
UNSW Student

HMAS *Newcastle* entering the Magnetic Treatment Facility at Fleet Base West for a deperm in May in preparation for her deployment to the Middle East
(RAN photograph)

NEWS FROM THE SECTIONS

Western Australia

Award of UNSW Prizes

At the RINA/IMarEST technical meeting of the Western Australian Section on 17 July, Tony Armstrong (Vice-President of the Australian Division of RINA) was delighted to represent the Australian Division Council as well as the University of New South Wales, and to present William Birdsall with two UNSW prizes for 2012:

- the RINA (Australian Division) prize for the best ship design by a student in the final year of the BE degree in naval architecture, for the design of a 33 m tug with 50 t bollard pull; and
- the David Carment Memorial Award for the best overall performance in the final year of the BE degree in naval architecture.

Both prizes include a medal engraved with the recipient's name, together with a cheque for $500 and the admiration of all RINA members.

William and his partner joined the RINA members and IMarEst members after the award ceremony to listen to a technical presentation on the Anzac frigate modification programme. He is currently working in Fremantle with International Maritime Consultants.

Tony Armstrong

William Birdsall (L) and Tony Armstrong at the presentation (Photo courtesy David Sherwood)

A little bit of history behind the prizes:

RINA Australian Division

The Institution of Naval Architects was formed in the UK in 1860, "…to advance the art and science of naval architecture". The institution was incorporated by Royal Charter in 1960, and thus became the Royal Institution of Naval Architects.

In Australia, the graduates of the diploma course in naval architecture formed the Institution of Naval Architects, Sydney Technical College, in 1947 with a meeting in Sue's Café (long since gone), near Wynyard railway station. The founding members include some of the legends of naval architecture in Australia, among them David Carment, Cecil Boden, Allan Payne, John Follan, Charles Sparrow, John Doherty and, last, but certainly not least, John Tuft, who became the first head of naval architecture when UNSW opened for business at Kensington in 1959. Membership of the Institution of Naval Architects STC was widened in 1952 to become the Institution of Naval Architects, Australia, and this Australian institution became a branch of the UK institution in 1954.

The RINA (Australian Division) prize was inaugurated at UNSW in 1971 to encourage the submission of high-quality ship-design projects.

David Carment

David Carment was born in Sydney in 1885. He had a great interest in ships and wanted to become a naval architect, which was an unusual ambition for a young man of his generation. In 1906 he went to Glasgow University and subsequently graduated with a Bachelor of Science degree in naval architecture, one of the first Australians to obtain a degree in naval architecture. He worked in shipyards on the Clydebank until he returned to Sydney in 1916 to take up a position as a naval architect at the Commonwealth Naval Dockyard, Cockatoo Island. He remained with the dockyard after it was leased to Cockatoo Docks & Engineering Company and he rose in the company to become Chief Naval Architect, and retired from there in 1954.

He gave much of his time in helping others obtain knowledge of naval architecture and shipbuilding. He became a part-time teacher in the shipbuilding trades course with the NSW Department of Education in 1919. He went on to become head teacher in the naval architecture diploma course at the Sydney Technical College, and was involved in the establishment of the naval architecture degree program at the University of New South Wales.

He had a great interest in yachting, and raced his own yacht, *Athene,* with the Royal Sydney Yacht Squadron for many years. He was the Squadron's honorary measurer, and issued the measurement certificate for *Gretel*, Australia's first challenger for the America's Cup in 1962. This 12-metre yacht was designed by Alan Payne, one of his former students at Sydney Technical College and former trainees in the drawing office on Cockatoo Island.

He was one of the founding members of the Australian Branch (now Division) of the Royal Institution of Naval Architects in 1947, and served as the President of the branch for a time.

This award commemorates David Carment's services to naval architecture in Australia, and in founding the naval architecture degree program at the University of New South Wales.

Phil Helmore

New South Wales

Committee Meetings

The NSW Section Committee met on 13 May and, other than routine matters, discussed:

- SMIX Bash 2012: The books have been closed off, donations made, and letters of thanks and certificates of appreciation were sent out to sponsors.
- SMIX Bash 2013: A booking for *James Craig* has been

pencilled in with the SHF for Thursday 5 December, but the deposit has not yet been paid.

- Crewing RINA Stand at Pacific 2013 Exposition: Options for crewing the RINA stand at the Pacific 2013 Exposition were discussed.
- TM Program for 2013: A presentation for September has had to be postponed to 2014, and a presentation for October to be checked.
- Walter Atkinson Award: Kim Klaka has been instrumental in re-instating this award for the best technical paper presented to the naval architecture community in Australia, and sections have been requested to submit two nominations; possible contenders were discussed.

The NSW Section Committee also met on 1 July and, other than routine matters, discussed:

- SMIX Bash 2013: SMIX Bash Committee has not met since the last meeting of the NSW Section Committee.
- Recording of TM Presentations: Engineers Australia have not been able to provide us with numbers of "hits" on webcasts of presentations at technical meetings, and are enquiring of Mediavisionz, their service providers. Some presentations are still not accessible from the EA website unless you are a member of EA, although we have requested that all RINA/IMarEST presentations be made publicly available. However, if you know the URL, you can access the webcast directly, see The Internet column elsewhere in this issue.
- Walter Atkinson Award: Possible contenders narrowed to six, and these would be reviewed by three committee members, ranked, and the two highest-ranked nominated to the Australian Division.
- Crewing RINA Stand at Pacific 2013 Exposition: Options for crewing the RINA stand at the Pacific 2013 Exposition were further discussed, and Australian Division to be contacted.

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

Developments in Marine Protective Coatings

Tim Haughton of Jotun Australia gave a presentation on *Developments in Marine Protective Coatings* to a joint meeting with the IMarEST attended by 22 on 5 June in the Harricks Auditorium at Engineers Australia, Chatswood.

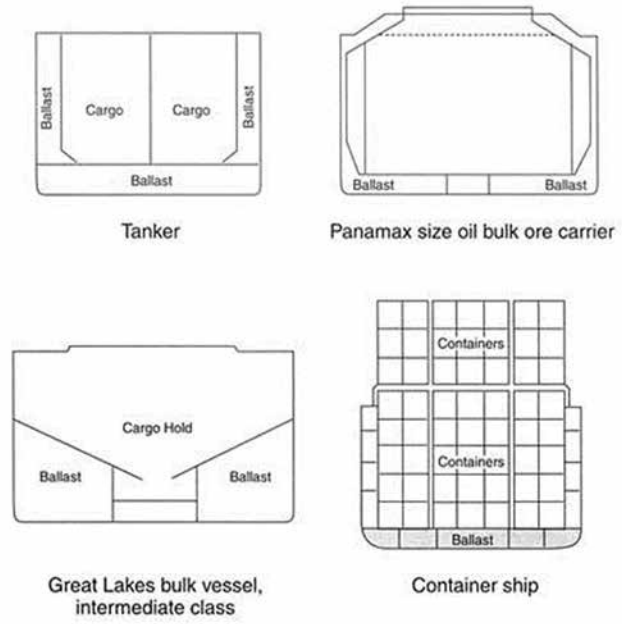
Introduction

Tim began his presentation with background on Jotun, a company with head office in Sandefjord, Norway, 74 offices in in 43 countries, 39 factories located on all continents and 8514 employees.

In 2008, the International Maritime Organisation introduced new requirements for ballast-tank coatings on newbuilding vessels to increase the coating life to 15 years. Antifouling paints are still developing, following the banning of tri-butyl tin based products.

Ballast Tanks

Ballast Tanks need to be in good condition for efficient operation of the vessel. Ballast tanks are often arranged in the double-bottom spaces or at the sides of the cargo holds. Here Tim showed a slide of the cross-sections of some typical cargo vessels and how the water ballast tanks are arranged in each.



Water-ballast tank arrangements
(Diagram courtesy Jotun Australia)

Ballast tank coatings have become a focus of attention for the industry, for governments, environmental agencies and classification societies. The challenge with ballast tanks is that, while they are the area where corrosion will have the strongest effect on value reduction, they are also the area where effective maintenance is most difficult. The aim is to increase the lifetime of the vessel, and the best time for lasting protection is at the new building stage.

Standards for Performance

The International Association of Classification Societies (IACS) published Recommendation 087, *Guidelines for Coating Maintenance and Repairs for Ballast tanks and Combined Cargo/Ballast tanks on Oil Tankers.* This gives the following guidelines for tank coating conditions:

	GOOD (3)	FAIR	POOR
Breakdown of coating area rusted	<3%	3 – 20%	>20%
Area if hard rust scale	-	<10%	≤ 10%
Local breakdown of coating or rust on edges or weld lines	<20%	20 – 50%	>50%
Jotun abbreviations of coating condition	Very Good and/or Good		Fair and/or Poor
	* Depending on area of rust located.		

Notes:
1)% is the percentage of the area under consideration or of the critical structural area
2)% is the percentage of edges or weld lines in the area under consideration or of the "critical structural area
3)Spot rusting i.e. rusting in spot without visible failure of coating

IMO Standards for coating condition
(Table courtesy Jotun Australia)

IMO MSC.215 (82) *Performance Standard for Protective Coatings* (PSPC) for water ballast tanks is a standard designed to achieve a target coating lifetime of 15 years in dedicated seawater ballast tanks and double side-skin spaces of bulk carriers. Adopted on 8 December 2008, the IMO PSPC for water ballast tanks is applicable to all newbuildings of 500 GT or more where the building contract was placed on or after 1 July 2008, the keel was laid on or after 1 January 2009, or the delivery was on or after 1st July 2012. For Common Structural Rules vessels (tankers and

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IMO Guidelines for coating condition
(Table courtesy Jotun Australia)

bulk carriers) the adoption of the standard is now mandatory. The PSPC is designed to control the quality of ballast tank coatings, including surface preparation, coating application, inspection, and coating quality. Improved quality also means improved safety. Cost will increase, but all have to comply, keeping the playing field level.

Product Requirements

Some of the basic coating requirements include

- Coating Type: Epoxy-Based systems (including epoxy mastics) or other coating systems with performance according to the test procedure (i.e. new technology), use of a multi-coat system with contrasting colours, and a final coat of light colour to ease inspection.
- Pre-Qualification: Includes B1 approval, and five years in-service history where class has notation after five years of inspection of "Good".

There is a nominal dry-film thickness (DFT) of 320 µm and the 90/10 rule, with a maximum DFT as recommended by the paint manufacturer.

The number of coats should include two full coats and two stripe coats with epoxy coatings. The first stripe coat should be extensive, with the second according to need for thickness (or not). This can be evaluated with new technologies in line with specified testing procedures. A brush should be used for all stripe coats, but a roller can be accepted for scallops and rat holes.

DFT is controlled by measurements, including but not limited to

- at least one measurement per 5 m² of flat surface area;
- at least one measurement at 2–3 m intervals and at 15 mm from the edges of tank boundaries;
- longitudinal and transverse stiffener members and main supporting members;
- measurements according to drawings, in the standard at 2– 3 m intervals and not less than three sets between main supporting members, with one set at each end and one at the mid point;
- one set per side around openings;
- five measurements per 1 m², but not less than three, on complex areas such as large brackets of main members; and
- additional measurements as seen fit by coating advisor.

The durability of the paint system is linked to adhesion (a crucial element for durability, to prevent flaking and delamination, avoid undercutting of rust, and for wetting/penetrating the profile), compatibility with cathodic protection system, and characteristics of the paints (such as water absorption, wetting properties, and flexibility).

Coatings and cathodic protection are the most effective methods of protection against corrosion in a ballast tank. The environment in a water ballast tank, immersed in sea water or fresh water, includes a high-conductivity electrolyte and possibly polluted ballast water. There are alternating wet and dry conditions, leading to swelling and shrinking of the coating (due to water absorption) and very high humidity. There is variation of temperature in adjacent areas, such as the hull side by sunlight and the environment, or on a longitudinal bulkhead due to the cargo. There can also be bacteria-influenced corrosion due to aerobic or anaerobic bacteria.

There are further challenges when the vessel is carrying a heated cargo. The corrosion rate is usually higher under the deckhead, and there is an increased risk of cracks at the bulkhead between the cargo and the ballast tanks due to the temperature difference. Temperature changes when the cargo tank is frequently emptied will increase the risk.

Surface Pre-treatment

The performance of a paint system depends to a large extent on the adhesion to the substrate. To achieve good adhesion it is necessary to have a surface which is clean (has no salts, oil, grease or other impurities), and has a good anchor pattern (sufficient surface roughness). Blast cleaning creates roughness, but water jetting creates no additional roughness. Mechanical wire brushing may polish the substrate.

A routine for general surface treatment includes planning the job thoroughly, removing grease, oil, salt, and fouling, removing old, loose paint and thick layers of rust, pre-treatment, removing dust (vacuum-cleaning) and, finally, painting.

Primary surface preparation includes limiting total soluble salts to a maximum of 50 mg/m² of sodium chloride (NaCl). Surface pre-treatment after erection includes blasting butts and small damages up to 3% of total tank area to Swedish standard SA 3, or SA 2½ where practicable. If more than 3% damage occurs during outfitting, then damage must be blasted to SA 2½.

Here Tim showed a slide of the evaluation of pre-treatment methods.

Blast cleaning	Ideal
Power grinding	Not as good as blast cleaning, but best alternative
Power wire-brushing	Great risk of unwanted polishing
Manual wire- brushing	Not recommended. Very poor.
Needle hammer	Usable, but risk of unwanted rough surface
Power chiseling	Good in combination with other methods
Manual scraping	Usable in combination with other methods

Evaluation of pre-treatment methods
(Table courtesy Jotun Australia)

Rounding of edges to a minimum of 2 mm radius is very important to achieve a smooth coating and to give the required DFT around the edge. A 2 mm rounding can be achieved with three passes with a grinding disk.

A stripe coating is an additional coating of a different colour or shade in order to achieve the required DFT in difficult-to access corners, edges, and the like. Stripe coating of edges and corners is important to prevent breakdown of the coating due to insufficient DFT. Tim showed several slides of areas which had—and had not—received stripe coating, and it was clear that the non-stripe-coated areas had broken down and the steel underneath had rusted.

Spot blasting can be a cause of future paint damage. Blast cleaning destroys the edges of the intact paint film around the damage, and this results in poor adhesion. Damaged paint edges must be feathered prior to application of the new paint.

Vacuum-blasting equipment can be used for small repairs. Several types of nozzles can be used, which make it possible to cater for all steel profiles. All types of abrasives can be used, and it is possible to recycle the abrasives. It has a slow production rate, but is environmentally responsible.

Ultra-high pressure water jetting (UHPWJ) can be used, with water pressures up to 2500 bar (250 MPa). It is all manual equipment, which means that it is heavy work. Different types of nozzles can be included in one rotating nozzle unit. It removes water-soluble salts, and improves overall cleanliness. The size of the equipment makes it difficult to access some areas, and requires additional hand tooling for tight corners.

It is possible for the surface to be contaminated by oil from cleaning equipment, such as grinders. Reasons include oil leaking out of equipment, equipment having been stored with oil, or the lack of an oil trap or filter (air from compressors contains oil which must be removed).

Welding smoke and other contaminants must be removed prior to coating, e.g. by wire brushing. Welding smoke, if not removed, will result in osmotic blistering.

Key Factors in Application

The key factors in application include wetting and adhesion properties (there are benefits in using surface-tolerant epoxy mastics), solids and dry film thickness, stripe coatings, two coats more than doubles security—single coats save time, but jeopardise the quality, regular planned inspections, quality control during surface preparation and painting, and every stage must be monitored to ensure that it conforms to specification.

Application of spray painting directly into a right-angled corner gives an uneven film thickness, but may still be satisfactory for many types of service. The better procedure is to spray each side of the corner separately, using a vertical spray pattern to give an even film thickness.

Tim then showed a photo of a painter high on a narrow scaffolding using a spraying lance which was to long for the job. The long spraying lance was difficult to handle on the narrow scaffold and the applicator too close to the structure, making it difficult to keep a constant distance and a correct angle to the substrate.

Another slide showed the inside of a water ballast tank where, between first and second full coats, a stripe coat had been applied to all welding seams and sharp edges and areas difficult to reach by airless spray. Round brushes produce the most effective stripe coat.

A too-thick application of paint is just as dangerous as a too-thin coat, as it can crack and allow the ingress of water, or lead to flaking of the paint itself. Heavy runs or sags of paint have to be removed, or the paint will break up and cause corrosion.

Ventilation

The importance of good ventilation while painting cannot be over emphasised. Solvent vapours are heavier than air, so suction should be from the lowest points in enclosed areas. As a guide for matching extraction capacity to tank size and application rate:

Tank volume m^3	Suggested fan capacity m^3/min	Air changes per hour
2–5	30	360–900
25–100	60	36–144
100–500	150	18–90
500–1000	300	18–36
1000–2000	450	14–27
2000–5000	600	7–18

A typical application rate when coating with 75% volume solids would be 4L/min using a spray gun, giving 0.35 m^3/min of solvent vapour. To maintain vapour concentration below 0.25% by volume requires 140 m^3/min fan capacity. Inadequate ventilation can result in air or solvent "trapped" between paint layers. This can result in a porous film where blisters and delamination will occur in future.

De-humidification is also important. Essentially, solvents and water vapour compete for the same volume of air and the available energy determines the dominant phase. Humid air conditions, where overnight cooling occurs, will cause a dew-point condition and it can take up to two hours for the condensation to evaporate even when the dew-point condition has passed. Hence significant care is required when using refrigerated dehumidification. It is important that, once this system is introduced, it is maintained at all times till coating application ceases. Also, simply heating the air will not overcome the problem. In particular, fossil-fuel-fired heating systems should be avoided.

Painting Materials

Traditional paints have low coverage and poor penetration. Epoxy mastics, on the other hand, are surface tolerant, have good penetration and high build. The surface tolerance depends on the penetrating properties of the binder. Epoxy mastics have the following benefits:

Feature	Benefit
Surface tolerant	• Lower preparation cost • Less resources needed • No sealer coat needed • Less down time
Application ease	• Application by airless spray, brush and roller • Easy to apply
High volume solids	• VOC compliant • Less solvent emission • Less environmental impact • Cost effective per m^2
Colour choice	• Light colours

Use of surface-tolerant epoxy mastics
(Table courtesy Jotun Australia)

Inspection

The largest single cost driver in these new IMO rules is the inspection requirement. There is more inspection, the inspection must be documented, and the defects and repairs of those defects must also be documented. Jotun wants to help reduce these costs by simplifying inspection with two well-proven methods: Pin hole/holiday detection (by luminous ballast tank coating) and visual DFT Control.

The application of an epoxy mastic coating with Visual DFT Control plus the addition of an optically-active additive makes the coating reactive to ultra-violet light and up to 50% in repair and inspection time can thereby be saved.

The procedure involves applying the first coat, and then shining a specialised ultra-violet light on the surface to monitor the quality of the wet film during application. On inspection of the dry film, areas of under/over application can be identified and remedial work undertaken. The second coat is then applied, and the inspection process repeated. At inspection of the first coat, defects or areas of under thickness show up as black spots under UV light. Areas of high dry film thickness appear much brighter than low thickness areas. At inspection of the second coat, areas that are holidays will show in the first coat and any other defects will be seen. By limiting opacity it is possible to have Visual DFT control.

The benefits for the yard include reduced inspection times (up to 50% saving), improved quality of first application, improved DFT control (especially maximum and minimum and on edges), verification of edge coverage, improved record keeping, and potential saving in material.

The benefits for the owner include improved quality of first application, improved performance throughout vessel life (reduced operating costs), inspection easier throughout life of vessel, easier record keeping, easier and earlier detection of any failures.

Mixing of a two-pack paint gives visual mixing control. The dark base makes it easy to see when the mixing is complete, which is not easy to see with a clear base. Poor mixing results in poor protective properties of the paint.

Marine Fouling

Marine fouling leads to increased frictional resistance, increased fuel consumption, and some work for the shipyard.

The marine fouling process starts instantaneously, and develops over time. It starts with a conditioning film, progresses with microfilms of bacteria, diatoms and protozoa, then macrofouling by algal spores and animal larvae and, finally, macrofouling by adult organisms.

The conditioning film is instantaneously formed and is an organic monolayer composed of glycoproteins and polysaccharides. It changes the chemical/physical properties of the surface and can be up to 1 μm thick. It has no effect on frictional resistance.

Microfouling or "slime" comprises bacteria, blue-green algae, diatoms, protozoa and other micro-organisms, and can be up to 1 mm thick. It results in a slight increase in frictional resistance.

Macrofouling comprises both grass and animals. Grass is usually green, brown or red algae, which grow only in the presence of light, and there is a significant increase in frictional resistance. Animals include barnacles, mussels, tubeworms, hydroids, bryozoans and tunicates and there is a significant increase in frictional resistance and cost of removal.

The barnacle is the public enemy Number 1, and should be stopped at the larval stage. The young larvae are swimming around searching for a good place to settle. Ideally the AF should give the message Get Off! And, if it still settles, then it will be killed before it develops to a barnacle.

How to Combat Marine Fouling?

Different methods have been used at different times

Period	Method
ca. 700 BCE	Lead sheathing
ca. 400 BCE	Mixture of arsenic and sulphur in oil
ca. 1750	Copper sheathing, tar and pitch
ca. 1900	Antifouling paints; i.e. release of biologically-active ingredients from paint

Modern antifouling paints have five main groups of raw materials: binders, pigments, extenders, biocides and solvents. Typical compositions are as follows:

Item		Component	Composition (%)
Binders		Acrylic polymers, rosin	20
Pigments	(active)	Cuprous oxide, zinc oxide, copper thiocyanate	45
	(colour)	Iron oxide, titanium dioxide	5
Extenders		Silicates, carbonates, sulphates bentonite (clay)	5
Biocides		Fungicides/algicides	5
Solvents		Xylene	20

The binder and the biocides are the key raw materials in antifouling paints. Antifouling biocides are the biologically-active ingredients which prevent fouling by killing early stages of attached organisms (spores and larvae). Historically, cuprous oxide (Cu_2O) has been the most important biocide in use over the last 100 years. Active biocides are generally not potent enough to affect established/adult organisms. A tri-butyl tin (TBT) based antifouling contains 20–50 % Cu_2O and 2–5% TBTO, while a TBT-free antifouling contains 20–50% Cu_2O and 2–5% organic biocide, so copper is still very important in tin-free antifouling paints.

Here Tim showed a map of the annual average seawater temperature world-wide, and this is important because the behaviours of hydrolysing antifoulings are very dependent on the seawater temperature. Hydrolysis is a chemical reaction and all chemical reactions are controlled by temperature. As a rule-of-thumb one can say that, in the temperature range of 0–50°C, the rate of chemical reaction increases by 100% for every 10°C that the temperature is increased. This is the reason for the higher antifouling DFT requirement on vessels trading in warm waters, and why Jotun asks for the trading pattern of the vessels for which they are asked to calculate the DFT for applied paints.

Hydrolysis (from the Greek hydro-, meaning "water", and -lysis, meaning "separation") means the cleavage of chemical bonds by the addition of water. Generally, hydrolysis is a step in the degradation of a substance. The reasons for choosing a hydrolysing antifouling include antifouling performance, self-polishing, self-smoothing, no build-up of leached layers, and predictability.

Hydrating antifoulings, on the other hand, are antifouling paints where rosin is the main component of the film-forming phase of the binder (at least 70%) in a self-polishing antifouling. Rosin is of natural origin (from trees) and is not a polymer. It has been used in antifoulings for more than 100 years.

A "leached layer" is a layer at the surface of an exposed antifouling where the composition has changed. All the water-soluble components in this layer have been dissolved. The remaining structure is therefore full of voids and the mechanical strength is reduced as a result of this. The only way, besides grit, to remove these layers is fresh-water washing at high pressures of at least 5000 psi (34 MPa) which is both expensive and time consuming, if at all possible.

The main difference between TBT products and most TBT-free antifoulings is the development of leached layers on the low/medium quality TBT-free products. If these thick leached layers are overcoated with an antifouling or a primer, then detachment is often the result. The adhesion break is in the leached layer, which has low mechanical/structural strength.

Fouling release coatings (FRC) have low surface energy, provide elastic and smooth films, and poor adhesion of fouling organisms to the surface. Advantages include the fact that they are free of metals (Cu, Zn, Sn, etc.), free of biocides, there is no polishing/consumption of the coating, and they retain their colour. However, they do have their challenges and limitations for fast, high-activity vessels. They have poor scratch resistance, but acceptable abrasion resistance. They must have a smooth finish in application. Adhesion is sensitive to application conditions, and they are subject to contamination.

Testing of Antifoulings

Antifoulings are tested in a number of different ways, including

- static exposure on rafts;
- dynamic exposure on rotors/discs;
- biocide release rates on rotating cylinders;
- in-service testing on bilge-keel panels; and
- in-service testing on test patches.

All of these provide information on the performance of antifoulings over time and at different speeds through the water.

Jotun Range

Tim then showed a chart of the Jotun range of antifouling paints, with applications covering hull materials of aluminium, steel, FRP and timber, hull speeds from 15 to 30 kn, and operational lives from 15 to 60 months.

Conclusion

Significant developments have taken place in the field of marine protective coatings and, in particular, in the areas of ballast tank coatings and antifouling paints.

Questions

Question time was lengthy and elicited some further interesting points.

Luminosity in ballast tank coatings lasts for 2–3 years after coating, and it only needs to be applied in the first coat.

Silicon-based paints need drydocking for repair.

Hydrolysing antifouling would be specified (as opposed to other types) if the vessel had a trading pattern with potential for hold-up (e.g. for months) as the antifouling would still be active because it does not depend on ship speed. FRCs give good fuel savings, but need in-water cleaning if the ship is held up. The higher the speed, the better, for FRCs—15 kn is an absolute minimum, as they do not work below that speed. Inspection during application of all paints is vital, because remedial work is so expensive.

Most blocks of structure are now blasted and painted before assembly on the building berth. However, the margins need to be reblasted and primed before welding and connection to the next section.

Calculation of the amount of paint to be applied to a given external area can provide a useful check that the paint has been applied at the correct thickness. However, it is difficult to calculate/measure the surface area in tanks, due to the complexity of cross-stiffening, brackets, cut-outs, etc.

With spray painting, it is common to allow a loss of 30% externally due to wind, but less than this in tanks.

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

Tim’s presentation was recorded by Engineers Australia and is available as a webcast at www.mediavisionz.com/ea/2013/easyd/130605-easyd/index.htm.

Conversion of a Chemical Carrier to an FPSO

Matt Duff of ASO Marine Consultants gave a presentation on *Conversion of a Chemical Carrier to an FPSO* to a joint meeting with the IMarEST attended by 34 on 3 July in the Harricks Auditorium at Engineers Australia, Chatswood.

Introduction

Matt began his presentation with a summary of ASO Marine Consultants’ previous experience in conversion projects, which include:

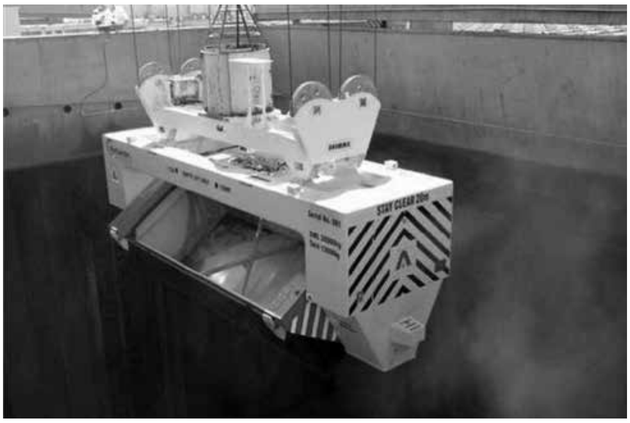
- *Four Vanguand* — Conversion from an Aframax tanker to an FPSO operating on the NW Shelf.
- *Crystal Ocean* — Various modifications/additions during her operating charter in Bass Strait.
- *Front Puffin* — Stability and motions following conversion.

Some of ASO Marine’s recent projects include the jack-up barge *Desley Anne* for Walz Marine. They have recently become involved in load-out jobs for companies bringing equipment from south-east Asia to Australia, and here Matt showed photos of load-out jobs in Newcastle and Cape Lambert, WA. They have also been involved in the design of the Rotainer bulk unloading system which is hung off a shore-based crane and picks up an open-top 20 ft container (carrying bulk coal, iron ore, sugar, wheat, woodchips, or other material in bulk), from a train, moves it over the ship, and rotates the container to empty the contents into the hold.

Stena Caribbean

Stena Caribbean was the first of a pair of sophisticated, 10 000 dwt, diesel-electric chemical tankers built by the Gdynia shipyard in Poland for Stena Bulk’s service in the Caribbean under a long-term charter with Texaco Eastern Caribbean Ltd and delivered in 2002. The second vessel, *Stena Calypso*, was also to the shipowner’s C-Max design, an adaptation of the much larger V-Max crude carrier design, combining a wide-beam, shallow-draught hull configuration with exceptional manoeuvrability and enhanced operational safety and flexibility.

Load-out at Cape Lambert, WA
(Photo courtesy ASO Marine Consultants)



Rotainer bulk unloading system
(Photo courtesy ASO Marine Consultants)

Stena Caribbean prior to conversion
(Photo courtesy FKAB Marine Design)

Principal particulars of the two vessels built were

Length OA	120.7 m
Beam	23.80 m
Depth	9.50 m
Draft	6.53 m
Deadweight	9996 t
Tanks	14
LPG tanks	2
Class	ABS

The vessel had a single submersible pump in each tank so that different products could be delivered to different locations, as opposed to having the usual arrangement of a ring-main manifold, and so there was lots of on-deck piping which impacted heavily on the conversion project.

Project Background

The company BC Petroleum was set up to develop the Balai Cluster gas and oil field in the South China Sea, approximately 100 n miles NW of Bintulu on the coast of Sarawak, Malaysia. This was to be competed in two phases:

- pre-development — drilling appraisal wells at each of the well-head platforms (WHP) and performing extended well tests on each field utilising an early-production vessel (EPV); and
- development.

Stena Caribbean was purchased by BC Petroleum to be converted for use as the EPV. Although designated an EPV, she falls under the umbrella of FPSO (floating production, storage and offloading) vessel.

There are four well-head platforms; Bentara, Balai, Spaoh and West Acis, and D35 is an existing rig. The plan was for the EPV to tie to each of the well-head platforms in turn and complete 30 days of extensive testing on each well. Depending on the make-up of the product, they would flare the gas and store the oil. On completion of testing and, depending on production rates from each, they would tie one, two or three wells together and run a pipeline to Bintulu, Sarawak.

This involved conversion of a 120 m vessel; for a total of 120 days of operation on four well heads, with no guaranteed future after that!

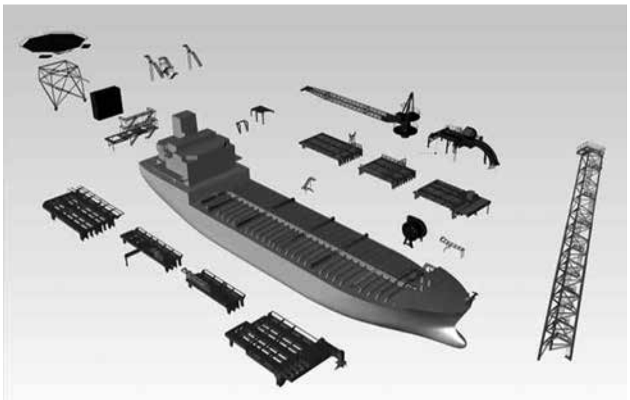
The Conversion

Stena Caribbean arrived at Keppel Shipyard Tuas, Singapore, in March 2012, and ASO Marine was awarded the contract in April 2012. The original schedule was for the vessel to depart the yard in August 2012. During a very hectic design phase, her ten-year special survey was completed, and class was transferred from ABS to BV for the conversion. The LPG tanks were removed, a process plant and flare tower were installed, an offshore-rated crane and laydown area were installed, a floating hose, hose reel, hawser and hawser reel were installed, the accommodation was upgraded from 16 to 40 persons on board, a helideck was installed aft of the accommodation, a DP2 dynamic positioning system was installed, and the vessel was renamed EPV *Balai Mutiara*.

The engineering scope of work for ASO Marine included

- vessel motions analysis — both moored and free running;
- mooring concept verification;
- stability analysis;
- longitudinal strength analysis;
- helideck support structure;
- accommodation upgrade;
- freefall lifeboat — integration and support structure;
- offshore-rated crane — integration and support structure;
- raised decks;
- process plant;
- laydown areas;
- dropped-object protection;
- flare tower;
- hose reel — integration and support structure; and
- forward mooring.

Here Matt showed a slide of the ASO components exploded around the vessel.



Engineering content of the conversion
(Image courtesy ASO Marine Consultants)

The vessel arrived in the Keppel yard after ten years in service. She had been well designed, and well built by the Gydinia shipyard in Poland, but had spent little time in port. The crew would load, run and deliver to Ports A, B, C and D, etc., and so were always preparing for the next loading or discharge and there had been little in-service maintenance. Here Matt showed a number of views of the ship as she arrived.

The plethora of deck piping impacted on where they could land the supports for the raised deck structures, and they ended up having to build plinths on top of transverse bulkheads, and land the supports on top of the plinths.

View of deck showing the plethora of piping
(Photo courtesy ASO Marine Consultants)

The raised decks and flare tower were built in the Keppel shipyard and lifted on board (70–80 t each). The challenge with the flare tower was to transfer the loads into the ship's structure, because they were limited in where they could land the tower legs.

View of deck showing a plinth for raised-deck structure (bottom)
(Photo courtesy ASO Marine Consultants)

Raised-deck structure being lifted on board
(Photo courtesy ASO Marine Consultants)

Technical Issues

Some of the technical issues faced included:

- Stability: Weight increases cut into the cargo carrying capacity, and the raised VCG had a negative effect on stability. The removal of the two LPG tanks from the

View from the top of the flare tower, showing the crane (left), hose reel (centre) and hawser chute (right)
(Photo courtesy ASO Marine Consultants)

main deck helped, but the addition of the raised decks, flare tower and helideck more than ate up all of that benefit.

- Deck strength: She was a very well designed vessel with no appreciable margins. The transverse deck beams had a usage coefficient of 0.98, so they could not land structure on the deck beams, and had to land it all on transverse bulkheads.
- Limited deck real estate: A large percentage of the deck was blanketed in pipe work, limiting options to connect the conversion structures into existing deck structure. The exact locations of the pipes were unknown, so they had to measure everything on site.
- Generic deck capacity requirements. In lieu of actual deck loads, a blanket load per unit area was specified; this was conservative, and so much was over-designed, thereby increasing structural scantlings.

Lessons Learned

'Fast' and 'track' are just two words. Putting them together doesn't meet contract deadlines! Unfortunately, they put deadlines on the vendors, and were then limited to the vendors who were prepared to take on the jobs on short time-scales. The process equipment, in particular, was delivered late, and was sub-standard when it arrived.

Sharing of information between sub contractors can make or break a project. They did not know the mass of skid-mounted equipment, because no-one knew! When they did obtain the information, it could change, and that could change the layout, for example.

Quality costs money. Lack of quality costs much more. Here Matt showed a number of slides of parts which did not fit properly and required re-work, belting up the ultimate cost.

Summary

The original schedule was for the conversion to be completed in August 2012. In the event, she was completed in February 2013. When last heard of, she had successfully completed final DP trials at one of the well-head platforms and returned to Bintulu prior to her first operation. There were lots of issues in the course of the conversion, but ASO Marine were happy with what they delivered, and they were not on the red-flag list as the cause of any delays.

Matt paid tribute to the whole team at ASO Marine who worked tirelessly to ensure that they could deliver: Dawei Cai, Greg Hughes, Andy Kent, David Beresford, Lachlan Torrance, Liam Finegan and Craig Boulton. In addition, Ed Ballard and the team from Orwell Offshore, who did the vessel motions analysis.

Balai Mutiara after conversion
(Photo courtesy ASO Marine Consultants)

Questions

Question time was lengthy, and elicited some further interesting points.

The change of class was done for commercial reasons. BC Petroleum had previously looked at another vessel which was in BV class for conversion. When it came to *Stena Caribbean*, BV made them an offer that they couldn't refuse.

The vessel did not obtain DP2 (dynamic positioning) notation. She has two stern trusters and one bow thruster. However, the bow thruster is not strong enough for the DP2 notation. Everything else is up to speed, but there was no room to fit a larger bow thruster. The power is not required for the vessel's operation, and so there was no problem with not obtaining the DP2 notation.

The vessel is tethered to the well-head platform, and relies on the DP gear to hold station in up to a 2 m sea state, and then disconnects. The vessel is not likely to operate during the monsoon season, and so has good operability in the 120-day window of operations.

There was no laser survey of the vessel, and racking could have been a problem for installation of the raised decks, etc. The plinth structures had been built over the transverse bulkheads, and gave them some flexibility for line-up. The Keppel build quality was good, as had been the original construction, and there were no major headaches with installation. However, a laser survey would have been nice.

Doing the job in Australia was not considered, as it was simply cheaper to do it in Singapore. Keppel are experienced in FPSO conversions, and have had almost a monopoly in the area. You cannot blame the operators, who have the bottom line of the budget to work to. The budget ran to multi-millions.

The helideck and pancake were of aluminium, and subcontracted for design and build to Aluminium Offshore in Singapore. They were built off site, erected at the Keppel yard and bolted together (there was no hot work on these). They were all raw (anodised) aluminium. Everything else in the conversion was steel.

The vessel was a double-hull tanker, with wing and double-bottom ballast tanks. She did have a slight list to port, and this was made worse by the addition of the conversion equipment (raised decks, crane, hose reel and hawser chute). Ballast always has to be carried on the starboard side to compensate. However, the vessel still maintains full cargo capacity in the ballast condition, so it is not a problem.

The vote of thanks was proposed, and the "thank you" bottle of wine presented, by Antony Krokowski, who had travelled from Brisbane for the presentation. Antony said that it had been well worth the trip, and he echoed one of Matt's lessons learned by saying that you can choose any two of time, cost and quality, but you can never obtain all three! The vote was carried with acclamation.

Matt's presentation was recorded by Engineers Australia and is available as a webcast at www.mediavisionz.com/ea/2013/easyd/130703-easyd/index.htm.

Operational Ocean Forecasting

Gary Brassington of the Centre for Australian Weather and Climate Research (CAWCR) gave a presentation on *Operational Ocean Forecasting: Status and Impacts* to a joint meeting with the IMarEST attended by 20 on 7 August in the Harricks Auditorium at Engineers Australia, Chatswood.

Introduction

Gary began his presentation with a description of ocean "weather", showing two videos, one of the surface currents surrounding Australia and the resolution of eddies, and another of the sea-surface height anomalies and the hills and dimples which are 100–200 km across which give rise to pressure gradients which, in turn, cause currents. The currents vary rapidly, but the sea-surface height varies slowly. The ocean is in constant movement, even when calm. There is ocean circulation occurring even when no wind blows.

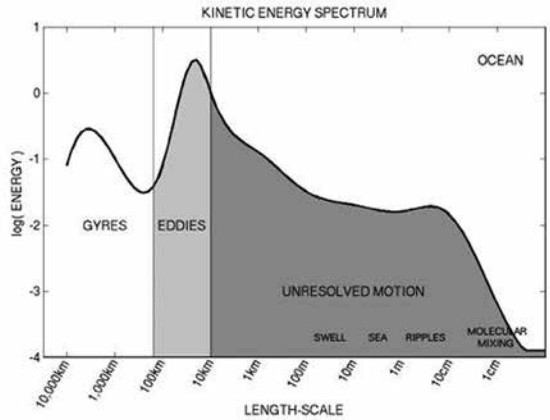
Marine weather is not the same as ocean weather; rather marine weather is the sum of ocean weather and atmospheric weather.

Ocean Dynamics — Mesoscale

Here Gary showed a slide of the coastline of NSW and the sea-level anomalies of the Tasman Sea, which can vary up to ±1 m over areas of 100–200 km across. This is a challenge to measure, and couldn't be done before the advent of altimetry. These gradients in sea level give rise to ocean currents, which can be up to 2 m/s (4 kn). The geostrophic current speed is the speed of the current calculated from the pressure gradient, the water density, the rotational velocity of the earth and the latitude, but neglecting the curvature of the path of the current.

The vertical structure of the humps and hollows of the sea level are derived with a core of low- or high-density water. Over an area of 100–200 km across, the density can vary from 1028 to 1024 kg/m^3 at a depth of 300 m, and the temperature from 25 to 12°C at a depth of 300 m. Integrating the density variation over the height of the water column gives rise to humps and hollows of about 0.6 m, which is what is found in practice. Integrating the geostrophic scale gives rise to currents of the order of 1–2 m/s which, again, are of the right order of magnitude.

Does the mesoscale matter? That really depends n the question that you want to answer. However, the mesoscale does not average out, as can be seen by inspecting the kinetic energy spectrum.



Kinetic Energy Spectrum
(Figure courtesy Gary Brassington)

Here Gary showed a graph of different applications on a time-space scale. We find that molecular mixing occurs around a length scale of 1 cm and a time scale of 1 s, while at the other end, climate change takes place on a length scale of thousands of years and a time scale of thousands of years. If someone tells you that they are forecasting the ocean, then they need to tell you over what area they are forecasting. Each of these applications requires different techniques for analysis.

El Niño (100 km, 5 years), for example, is being investigated by the Predictive Ocean Atmosphere Model for Australia. Eddies (100 km, 1 month) are being investigated by BLUElink Ocean Forecasting Australia. Surface tides (1000 km, 1 day) are predicted by the National Tidal Centre. Coastal upwellings (10 km, 1 week) are being investigated by BLUElink Ocean Forecasting Australia. Surface gravity waves (10 cm to 100 m, 1 s to 1 min) are being investigated by AusWAVE.

It is a challenge, as it is expensive to run models at the scales required. Current global models use typically 4000×2000×50 elements; where future global models are expected to use 10000×5000×100 elements and be able to predict finer spatial and time scales.

Australian Oceanography

Here Gary showed an outline of Australia and the principal currents which have been identified:

- East Australian Current
- Antarctic Circumpolar Current
- Flinders Current
- Leeuwin Current
- West Australian Current
- South Equatorial Current
- South Java Current

Here Gary showed a video of an animation of the movement of surface water, but the currents are elusive. Some can be seen clearly at some times of the year, but some are unstable. One of the measures used by oceanographers is to compare the ratio of eddy kinetic energy to total kinetic energy. Low ratios indicate semi-permanent currents, and high ratios indicate mesoscale eddies.

In January, the Gulf of Papua Gyre is a permanent feature east of Torres Strait, and the Antarctic Circumpolar Current, while composed of many filaments under Western Australia, becomes a distinct current under New Zealand. In July, the Leeuwin Current is a permanent feature at North West Cape, and rounds Cape Leeuwin connecting water masses with the Flinders Current west of Tasmania, and the East Australian Current, strong in January, weakens but is a permanent boundary current.

If you wish to forecast the ocean, it is like the weather-prediction problem — there is lots of turbulence!

GODAE Inter-comparison in the Tasman and Coral Seas

GODAE is the Global Ocean Data Assimilation Experiment which is being run by an international group coordinating research and development of operational ocean forecasting. The consortium includes groups from Australia, UK, USA, Japan, France and others. Task teams include those investigating intercomparison and validation, observing system evaluation, coupled predictions, coastal ocean and shelf seas, and marine ecosystems and predictions. They have a number of their own publications, and workers have a significant number of publications in journals and conference proceedings. [Full d*etails of GODAE and their publications can be found on their website, www.godae.org*—Ed.]

The paper by Oke, P.R., Brassington, G.B., Cummings, J., Martin, M. and Hernandez, F. (2012), GODAE Inter-comparison in the Tasman and Coral Seas, *Journal of Operational Oceanography*, **5**(2), pp.11–24 compared the characteristics of the Tasman and Coral Seas.

BLUElink Ocean Forecasting Australia has operated in three phases. In 2004–07 they developed the first operational ocean forecasting system, resulting in OceanMAPS in 2008, completed the first ocean re-analysis of 1992–2006 data (BRAN — the BLUElink re-analysis), and came up with an operator GUI for ocean–atmosphere modelling. In 2008–10 they fully upgraded OceanMAPS to Version 2, completed a second re-analysis (BRAN2) and coupled tropical cyclone modelling. They are now into their third phase, 2011–14.

Here Gary showed a table comparing the details of the various systems used by BLUElink's BRAN and OceanMAPS, UK's FOAM, USA's HYCOM and France's Mercator projects. It all depends on how much computing you can afford, but all have their own in-house atmosphere forcing functions, and their own schemes for data assimilation.

This was followed by a map of the Coral and Tasman Seas east of Papua-New Guinea and Australia, showing en estimate of the mean ocean circulation over the top 200 m depth. The results of the analysis were presented in a series of Taylor diagrams, and plots of the RMS error in T and S versus depth predicted by the various systems compared to the Argo-sampled results.

Taylor diagrams provide a way of graphically summarising how closely a pattern (or a set of patterns) matches observations. The similarity between two patterns is quantified in terms of their correlation, their centered root-mean-square difference and the amplitude of their variations (represented by their standard deviations). These diagrams are especially useful in evaluating multiple aspects of complex models or in gauging the relative skill of many different models. [S*ee www-pcmdi.llnl.gov/about/staff/Taylor/CV/Taylor_diagram_primer.pdf*—Ed.]

The Argo results come from autonomous vehicles which are programmed to descend to 1500 m, taking samples, and then ascend to the surface, send the data to a satellite, and re-descend for more sampling.

This was followed by maps of SSL (sea surface level anomaly) and SST (sea surface temperature).

The exercise came up with some important conclusions:

- Intercomparison is an important exercise
- Focus on Australian region
- Each GODAE system has strengths and weaknesses:
  - BLUElink — best for SLA
  - HYCOM — best for SST
  - Mercator — best for velocities
  - FOAM — best for sub-surface T and S
- Operational systems are under continual development
- Results would not be representative of the current systems
- A follow-up intercomparison exercise is now underway
- There are plans to make the intercomparisons routine

Significant progress has been made in reducing the RMS error in predictions from 0.11–0.13 in Version 1.2 in 2008 to 0.08–0.11 in Version 2.0 in 2012, and 0.075–1.0 in Version 2.1 in 2012.

Ocean Forecasting Australia Model 3 (OFAM3) is a near-global (i.e., non-Arctic) eddy-resolving configuration of the Modular Ocean Model, developed principally for the purpose of hindcasting and forecasting upper-ocean conditions in non-polar regions when used in conjunction with a data assimilation system. The model grid has 1/10^{o} grid spacing for all longitudes and between 75^{o}S and 75^{o}N (~ 8–11 km x 11 km) and is composed of 3600×1500 grid points. The vertical model coordinate is z-star, with 51 vertical levels, with 5 m resolution down to 40 m depth, and 10 m vertical resolution to 200 m depth. There is an implicit tidal mixing, i.e. increased mixing over the water column, and higher bottom friction in regions of strong tides (e.g. NW Shelf of Australia and Indonesian Seas).

Impacts

Applications of the ocean forecasting methods include:

- Ocean currents: Oil spill and pollutant tracking, search and rescue, ship routing and towing operations, offshore drilling operations, diving operations, sailing, etc.
- Ocean temperature: Defence (sonar), safety, commercial/recreational diving, eco-tourism, weather forecasting, sea fog, hypothermia warnings, coral bleaching—marine park management, by-catch fisheries management, etc.
- Ocean sea level: Coastal flooding/erosion, port management, Torres Strait shipping, etc.
- Others: Hydrological cycle, carbon cycle, ocean dynamics research, climate, marine ecosystem research, renewable energy, etc.

Persistent easterly winds (upwelling favourable winds) have been observed off eastern Bass Strait. On 8 February 2010, a forecaster noted a discrepancy between the RAMSSA (Regional Australian Multi-Sensor SST Analysis) and

BLUElink models of sea surface temperature. Dew points were estimated to be 17–19°C. RAMSSA showed 18–19°C (i.e. no fog) while BLUElink showed 14–15°C (i.e. sea fog). A major sea fog event took place in this case.

The Montara oil spill was an oil and gas leak and subsequent slick which took place in the Montara oil field in the Timor Sea, off the northern coast of Western Australia. It is considered one of Australia's worst oil disasters. The slick was released following a blowout from the Montara well-head platform on 21 August 2009, and continued leaking until 3 November 2009 (in total 74 days), when the leak was stopped by pumping mud into the well and the well bore cemented, thus "capping" the blowout. Particles based on ocean forecasts on 30 August correctly captured a change in oil spill direction.

Rapid storm development aligned with the SST front on 8 June 2007 caused flash flooding resulting in deaths and the grounding of *Pasha Bulker* at Newcastle. The SST front was sustained by deep core eddies and heat content.

Severe coral bleaching events can be linked to anomalously-high heat content in the Coral Sea prior to seasonal low winds/clear skies. The heat content of the Coral Sea is weakly correlated to SST due to the skin effects. An ocean forecast system and seasonal forecasting system are useful for marine park management.

Conclusion

Marine weather forecasting is improving all the time as more effort is directed into this area. The predictions are increasingly useful, and have already been used in a wide range of applications.

Questions

Question time elicited some further interesting points.

The predictions are used by ocean-racing yachts, including those participating in the Sydney–Hobart Yacht Race. The maxi yachts are usually looking for wind, while the slower boats are usually looking for current. The models are set up with a 9-day window and set to give useful predictions.

Rogue waves are not easily predicted. However, reporting of occurrences is improving, and they are understanding the mechanisms and causes much better. The Agulhas Current is the western boundary current of the southwest Indian Ocean. It flows down the east coast of Africa from 27°S to 40°S. It is narrow, swift and strong, and one of the strongest in the world. The CAWCR is liaising with the South African researchers and coupling with their wave model.

In the Coral Sea there is a shallow top layer. There is nothing to take account of the age of the drifting buoys which transmit current data; some are drogued and some undrogued, and this is not always given in the data. There are choices to be made in the turbulent mixed layer scheme, and we are looking for shears to be in the mixed layer parameterisations.

Collisions of ships with buoys are unusual and, when they do happen, do not result in damage to ship or buoy as the buoys are small. There may be several thousand in the world's oceans but, over a massive area, the occurrence of collisions is low.

Ocean waves crossing have the potential to take energy out of upwellings and eddies, heading either into or out of the current. This is useful to explore under the influence of tropical cyclones, but requires the full atmosphere/wind/wave/current interaction.

There are effects from the outflow of major rivers. There are few such effects in Australia, but there is the Fly River in Papua-New Guinea, for example, and they are working towards fixing this problem.

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

Gary's presentation was recorded by Engineers Australia and is available as a webcast at www.mediavisionz.com/ea/2013/easyd/130807-easyd/index.htm.

Presentation of the Denny Medal

The prestigious Denny Medal is awarded by the Institute of Marine Engineering, Science and Technology (IMarEST) for the most worthy paper published in its technical proceedings. The medal is awarded by IMarEST Council following recommendation from the Editorial Boards and the Proceedings Supervisory Board. The Denny Medal was first awarded in 1893 following a £250 capital gift from Peter Denny in 1892.

Peter Denny, the fifth son of William Denny (1779–1833), was born at Dumbarton, on the Clyde River in Scotland, where the family had been involved in boat building since at least the middle of the 18th century. He joined his two elder brothers engaged in iron shipbuilding in 1844 and in 1850 he went into partnership with John McAusland and John Tulloch. Peter Denny was the first to experiment with iron screw steamships, and his success lead to a large expansion of the business. He was a considerable benefactor to the town of Dumbarton.

The Denny Medal for 2012 was awarded to the paper by Oke, P.R., Brassington, G.B., Cummings, J., Martin, M. and Hernandez, F. (2012), GODAE Inter-comparison in the Tasman and Coral Seas, *Journal of Operational Oceanography*, **5**(2), pp.11–24.

The inscribed medal was presented to Gary Brassington by Alan Taylor, former President of the IMarEST, following Gary's presentation to RINA and IMarEST at Chatswood on 8 August 2013.

Phil Helmore

Alan Taylor presenting the Denny Medal to Gary Brassington (Photo Phil Helmore)

CLASSIFICATION SOCIETY NEWS

GL Releases New Guidelines for Complex Data Networks

Germanischer Lloyd (GL) has published new guidelines for data networks which are implemented onboard ships or offshore platforms. As the maritime industry makes greater use of automated systems, data networks have become more and more complex, while also integrating safety-critical and non-safety-critical application systems.

One of the main reasons for the increasing number of application systems which are connected through data networks is to minimise the total length of cabling installed throughout the vessel. Minimising cable length not only reduces the material and installation costs for the cabling, but also avoids adding unnecessarily to the overall mass of the ship or the platform. This is especially relevant in cruise vessels, where the delivery of high-quality interactive entertainment services to passengers is increasingly important.

In merchant shipping, more and more vessels are equipped with integrated bridges which link information from the navigation and automation systems. Today, as well, modern automation systems are themselves complex integrated systems which comprise several monitoring sensors, control systems for the propulsion and power-generating systems, and monitoring and alarm systems.

A type approval would be required for data networks which connect application systems related to classification such as: automation system, navigation system, alarm and monitoring system, general alarm and public address system, comprising all the necessities for monitoring, control and safety including input and output devices. Non-class-related application systems would include entertainment systems such as radio, television, audio and video on demand, and private internet access. The required approval would cover the entire network, including routers, switches, and process controllers connected with network cables.

In order to follow a systematic and reproducible risk-based approach for the approval process, a so-called Requirement Class is assigned to the respective data network. The scope of documents to be submitted for approval and the required function tests depend on this assignment.

There are five different Requirement Classes, differentiating the individual network according to the magnitude of the damage which would result from a potential component or system failure and its effect on the persons onboard, the environment and the technical condition of the vessel. This approach follows the same procedure as the approval process for computer systems under GL's Rules and Guidelines.

The guidelines are available for download from the GL website and entered into force on 1 August 2013.

GL Releases Thickness Measurement Software Pegasus 2.0

The latest version of classification society Germanischer Lloyd's (GL) thickness-measurement software Pegasus, was recently released. To verify the structural integrity of a vessel, hull thickness measurements must be periodically taken, with each measurement point documented. The number of required measurement points can number up to 20 000—all repeatedly measured over the life of the vessel, creating a vast amount of essential data which must be effectively managed and assessed.

GL developed Pegasus to improve the preparation, recording, assessment, storage and reporting of such measurements, and this latest release of Pegasus extends the current hull integrity management package to include combined functionality with the condition-monitoring package GL HullManager. 3D models utilised in GL HullManager can be used directly for recording thickness measurements with Pegasus, while thickness measurements recorded with Pegasus can be easily integrated and used in GL HullManager. The accumulation of an accurate long-term database of thickness measurement results allows more-precise scheduling and planning for repairs, as well as predicting future corrosion.

Release 2.0 of Pegasus offers an integrated software solution supporting thickness measurements independent of whether or not a 3D structural model is available. Even partially-incomplete 3D structural models are supported by using tabular input for the missing parts. Independent of which method is used for recording assessments like hot-spot lists and statistics, reports in IACS format are presented in a unified manner.

New features in Version 2.0 include integration of 3D model-based and table-based recording of measurements and assessment functionality, a revised navigation panel which gives a better overview of the measurement content, and program functionality and support for table-based measurement recording and assessment for bulkers and tankers built according to IACS Common Structural Rules.

First released in 2008, GL Pegasus was introduced for recording thickness measurements to 3D structural models. Two years later, GL Pegasus Lite became a mandatory tool for all GL-certified thickness-measurement companies. It was able to handle thickness measurements without requiring a 3D structural model of the vessel. Currently more than 300 GL certified thickness-measurement companies use GL Pegasus Lite. GL Pegasus and GL Pegasus Lite will now be replaced by the integrated version, Pegasus 2.0.

Pegasus 2.0, like GL Pegasus Lite, is available free of charge. Program licenses required for using a structural 3D model are available on request.

Mike Mechanicos

LR's New and Updated Publications

Various set of rules and guidance notes have been produced or updated by Lloyd's Register over the last few months, and can be downloaded(mostly free of charge) from www.webstore.lr.org.

Some that may be of interest to readers of *The ANA* are:

- July 2013 editions of the Ship, Special Service Craft, and Naval Rules.
- Guidance Notes for the Classification of Windfarm Service Vessels.
- Asbestos on ships – how to manage it safely.
- Pocket Guide to Solid Bulk Cargoes.

The 2013 edition of the SSC software (which calculates scantlings according to the SSC Rules) is also now available for download. Evaluation licences which allow you to try before you buy can also be obtained via the LR Webstore, or by contacting sydney@lr.org

LR's Guide to New Construction in South Asia

As shipbuilding nations in South Asia mature, Lloyd's Register's first *Guide to New Construction in South Asia* provides an overview of over 80 shipyards and 18 ship designers in Bangladesh, India, Indonesia, Malaysia, the Philippines, Singapore, Sri Lanka, Thailand and Vietnam.

The *Guide* provides an overview of the shipbuilding and ship design industry in the area. With shipbuilding in South Asia growing — in numbers of ships, in capacity and in capability, this LR guide provides factual information from across the countries.

A PDF of the guide can be downloaded from www.lr.org/southasia and hard copies are available to pre-order from www.webstore.lr.org

Lloyd's Register to Support Development of LNG Bunkering in Singapore

Lloyd's Register won the Maritime and Port Authority of Singapore (MPA) contract to develop operational procedures and technical standards required to develop LNG bunkering capabilities in the Port of Singapore.

In the contracted work, which has already commenced, Lloyd's Register will identify technical specifications, LNG bunkering procedures, and development of crew competency for LNG bunkering in the Port of Singapore, to support Singapore in developing its ambitions to develop the capability and infrastructure to supply LNG as a fuel for ships.

Ng Kean Seng, Marine Country Manager for Lloyd's Register in Singapore, said "Singapore is supporting efforts to create a clean fuel future for global shipping by developing LNG bunkering operations. We are supporting Singapore in realising that ambition. We have assembled a global team experienced in addressing the requirements and in identifying what needs to be done to really address safety and the operational issues to make safe LNG bunkering possible."

Lloyd's Register will provide detailed guidance to MPA on what is required to ensure that the technical specifications of hardware are identified, the right operational procedures are established, port safety and emergency planning is provided for, and personnel competence can be developed effectively and put in place.

Much of Lloyd's Register's experience is from decades of LNG carrier classification leadership and understanding ship-to-ship (STS) transfer of LNG. STS transfer has been a principal area of development for large-scale transfer of gas and is important experience. Most recently, risk leadership undertaken for bunkering operations at the Port of Stockholm to support the high-volume bunkering required for the *Viking Grace* passenger ship project, now successfully in operation carrying 2800 passengers between Stockholm and Turku, has further added to Lloyd's Register's experience and track record.

Luis Benito, Global Marine Marketing Manager, Lloyd's Register, commented "This contract allows us to apply the knowledge and experience gained in the technical consultancy, de-risk and classification approvals we have delivered to recent innovative gas-transferring systems and gas-fuelled ships globally, and support Singapore Port to get ready for real LNG bunkering operations, both for short-sea and deep sea shipping, making safe LNG bunkering possible."

Chris Hughes

FROM THE CROWS NEST

Symbols

It may interest readers to know the correct symbols for "nautical miles" and "knots".

The International Bureau of Legal Metrology (BIPM) was set up in 1875 to ensure world-wide unification of physical measurements. Their publication, *The International System of Units,* 7th Edition (1998), states that "As yet there is no internationally agreed symbol" [for the nautical mile]. Similarly, there is no symbol for knot.

However, in Australia, the National Measurement Regulations prescribe the Australian legal units of measurement of any physical quantity and prefixes which may be used. These include the following non-SI units accepted for use with the International System:

Item	Name	Symbol
3.7	nautical mile	n mile
3.17	knot	kn

By way of explanation, there is no abbreviating symbol for mile ("m" is used for metres) and this is always spelled out. For nautical miles, a space is required after the "n" to indicate that it is not nanomiles that is intended.

The symbol for knots is distinguished from "kN" for kilonewtons by the difference in cases of the "n" and "N"; the use of "kt" is incorrect as this is the symbol for kilotonnes.

You will find that AS ISO 1000 — 1998 *The International System of Units (SI) and its Application*, AS/NZS 1376 — 1996 *Conversion Factors,* and the Commonwealth Government's *Style Manual for Authors, Editors and Printers* (5th Edition, 1994) are all subordinate to the National Measurement Regulations, and give the symbols quoted above.

The above was originally published in The February 2000 issue of *The ANA*.

Phil Helmore

COMING EVENTS

NSW Section Technical Meetings

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

The program of meetings remaining for 2013 (with exceptions noted) is as follows:

4 Sep	Elliot Thompson, Department of Defence *Application of the IMO's Energy Efficiency Design Index to Naval Vessels*
2 Oct	Richard Stanning, McConaghy Boats *Buoyancy Control on James Camerons's* Deepsea Challenger
5 Dec	SMIX Bash

RAN 100th Anniversary International Fleet Review

On 4 October 1913 the first Royal Australian fleet entered Sydney Harbour led by battlecruiser HMAS *Australia*, followed by cruisers HMAS *Melbourne*, *Sydney* and *Encounter* and destroyers HMAS *Warrego*, *Parramatta* and *Yarra*. Many of the vessels featured in this historic event were newly commissioned for the Royal Australian Navy, including HMAS *Australia*. On the steps of Admiralty house, Admiral Sir George King-Hall, the last flag officer of the Royal Navy's Australian Station handed over command of the Australian station to the Royal Australian Navy.

In order to mark the 100th Anniversary, the Royal Australian Navy will hold an International Fleet Review of participating vessels in early October 2013. Full details are available on the IFR website, www.navy.gov.au/ifr/. The main events around the harbor include:

3 October

1100	Tall ships enter Sydney Harbour.
1830	Tall ships welcome reception. Location: Australian National Maritime Museum (Invited Guests).

4 October

0600–1600	Warships enter Sydney Harbour
1000	Ceremonial Fleet Entry and 21 Gun Salute. HMA Ships *Sydney, Darwin, Perth, Parramatta, Bundaberg, Diamantina* and *Yarra*. Location: Sydney Harbour.
1100–1600	Australian Surf Rowers Reception. Location: Sydney Opera House.
1830–2030	Visiting Ships Welcome Reception. Location: Garden Island (Invited Guests).

5 October	Dress ship. Location: Sydney Harbour.
1100–1430	Ceremonial Fleet Review. Location: Sydney Harbour.
1130–1200	Formation flypast by rotary- and fixed-wing aircraft. Location: Sydney Harbour.
1400–1900	Military demonstrations and Naval band performances.
1800–2030	Combined IFR Official Reception. Location: Sydney Opera House Forecourt (Invited Guests).
1930–2000	Pyrotechnics and Lightshow. Location: Sydney Harbour.

6 October

1000–1130	HMAS *Sydney* Memorial Service. Location: Naval Memorial, Bradley's Head.
1300–1800	Tall ships open to the general public. Location: Cockle Bay/Darling Harbour (TBC).
1300–1800	Warships Open Day. Location: Fleet Base East, Garden Island/Barangaroo.
1400–1530	Ecumenical Service. Location: St Mary's Cathedral.

7 October

0730–1015	Opening of Sea Power Conference 2013 and Pacific 2013 International Maritime Conference and Exposition. Location: Sydney Conference and Exhibition Centre, Darling Harbour. Royal Australian Navy Band recitals.
0800–1800	Warships Open Day. Location: Fleet Base East, Garden Island/Barangaroo.
0800–1800	Tall ships open to the general public. Location: Cockle Bay/Darling Harbour (TBC).

8 October

0800–1700	Sea Power Conference 2013 and Pacific 2013 International Maritime Conference and Exposition continue. Location: Sydney Conference and Exhibition Centre, Darling Harbour Royal Australian Navy Band recitals.
1000–1500	Combined Navies Golf Competition. Location: The Coast Golf Club.
1230–1400	HMAS *Penguin* Freedom of Entry to Mosman. Location: Mosman Central Business District.
1230–1400	Navy Memorial Service. Location: Cenotaph, Martin Place.
1300–1430	HMAS *Parramatta* Freedom of Entry to Parramatta. Location: Parramatta Central Business District.
1830–2030	Vice Regal Reception. Location: Government House, Botanic Gardens (Invited Guests).

9 October

1030–1100	Sea Power Conference 2013 and Pacific 2013 International Maritime Conference Closing Ceremony. Location: Sydney Conference and Exhibition Centre, Darling Harbour.
1230–1430	Combined Navies Parade. Location: George Street—The Rocks to Town Hall.
1430–1630	Lord Mayor's Reception. Location: Sydney Town Hall (Invited Guests).
1400–1630	Pacific 2013 IFR Ships' Companies Lunch. Location: Sydney Conference and Exhibition Centre, Darling Harbour. Closing of Pacific 2013 International Maritime Exposition. Location: Sydney Conference and Exhibition Centre, Darling Harbour.
1500–1730	Twilight sailing with RAN Sailing Association. Location: Sydney Harbour.

10 October

1100 Tall ships depart. Location: Sydney Harbour.

1000–1500 Combined Navies Sporting Competition. Location: Randwick Barracks/Macquarie Park.

11 October Warships depart. Location: Sydney Harbour.

For further details of planned events visit www.navy.gov.au/ifr/events or contact CAPT Nick Bramwell at nick.bramwell@defence.gov.au.

Pacific 2013

The Pacific 2013 International Maritime Exposition and Congress will be held at the Sydney Convention and Exhibition Centre in Darling Harbour from Monday 7 to Wednesday 9 October 2013. It will include:

- The International Maritime and Naval Exposition, organised by Maritime Australia Ltd, to be held from Monday 7 to Wednesday 9 October.
- The Royal Australian Navy Sea Power Conference 2013, organised by the Royal Australian Navy and the Sea Power Centre — Australia, to be held from Monday 7 to Wednesday 9 October.
- The International Maritime Conference, organised by the Royal Institution of Naval Architects, the Institute of Marine Engineering, Science and Technology, and Engineers Australia, to be held from Monday 7 to Wednesday 9 October.

Pacific 2013 IMC

The Pacific 2013 International Maritime Conference, organised by the Royal Institution of Naval Architects, the Institute of Marine Engineering, Science and Technology, and Engineers Australia, to be held from Monday 7 to Wednesday 9 October.

The conference program is now up and registrations are open on the website www.pacific2013imc.com. Full details of the conference, including the social program, can be obtained from the conference website or by contacting the conference organisers, arinex Pty Ltd GPO Box 128, Sydney, NSW 2001, phone (02) 9265 0700, fax (02) 9267 5443 or email pacific2013imc@arinex.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 will be held this year, there will be no HPYD conference in 2014.

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.

Collins-class Submarines Update

In June the Minister for Defence, Stephen Smith, and the Minister for Defence Materiel, Mike Kelly, announced further significant initiatives to both maintain the capability of Australia's Collins-class submarine fleet and further improve Collins-class maintenance, sustainment and availability.

The first Collins-class submarine, HMAS *Collins*, was commissioned in July 1996. The sixth and last of the class, HMAS *Rankin*, was commissioned in March 2003. The submarines were designed with a theoretical hull life of 28 years, which provides for an on-paper indicative service life for the fleet of 2024 to 2031.

A Service Life Evaluation Program was undertaken by Defence in 2012 to identify any issues that would prevent the submarines from achieving their indicative service life. The study also considered the possibility of a service life extension for the boats.

The study found that there is no single technical issue which would fundamentally prevent the submarines from achieving their indicative service life or a service life extension of one operating cycle, which is currently around seven years, excluding docking periods. Based on the commissioning dates of the submarines, this provides an indicative service life of the fleet of 2031 to 2038.

Combined Pass approval for Collins Obsolescence Management

In this context, Ministers Smith and Kelly announced that the Government has provided Combined Pass approval for the first stage of SEA 1439 Phase 3.1 Collins Obsolescence Management to resolve obsolescence in the Integrated Ship Control Management and Monitoring System in the Collins-class submarine fleet.

The Integrated Ship Control Management and Monitoring System was designed in the 1980s to control, manage and monitor essential Collins-class submarine functions such as manoeuvring, powering and life-support.

It is a highly-automated computerised system which enables the crew of the submarine to control, monitor and manage the large number of diverse and complex systems.

The Integrated Ship Control Management and Monitoring System has performed effectively and reliably since the class entered service in the 1990s. However, it is essential to ensure that the system can be maintained for the remaining indicative extended service life of the submarines.

The Government has approved ASC Pty Ltd to work with Saab Systems, in the first instance, to engineer replacements for obsolescent system components and update and test the system in on-shore test facilities and subsequently in one Collins-class submarine.

This first-stage work is valued at around $65 million and will be conducted at ASC Pty Ltd in Adelaide.

The Government has also given approval for Defence to plan for the second stage of the project to update the system in the remaining five submarines once installation and testing in the first submarine has been completed. Government consideration of the second stage is scheduled for 2017.

Implementation of the Coles Review: Full Cycle Docking Period Reduced to Two Years

Ministers Smith and Kelly also announced a major reform in the maintenance of the Collins-class submarines to improve submarine availability across the fleet of six submarines by reducing the planned full-cycle docking period for each submarine from three years to two years.

This reform is part of the extensive transformation program being implemented in the Collins-class submarine fleet maintenance and sustainment following the Study into the Business of Sustaining Australia's Strategic Collins Class Submarine Capability, led by Mr John Coles (the Coles Review).

Implementation of the Coles Review recommendations will improve Collins-class availability through a variety of mechanisms including the delivery of more efficient logistic-support arrangements, implementation of performance-based maintenance contracts with defence industry and the development of a revised approach to the programming of planned maintenance and usage.

A key recommendation of the Coles Review was that a reduction in the duration of planned maintenance for the Collins class would make the largest single contribution to a higher level of submarine availability.

Under the current Collins-maintenance cycle, each submarine operates in-service for eight years (including intermediate dockings) followed by a planned three-year full-cycle docking. The in-service period is punctuated by shorter intermediate-duration dockings and maintenance periods alongside.

This means that two submarines are in full-cycle docking at any one time with, in general terms, one and sometimes two in shorter dockings and maintenance. This means that Defence can currently plan on having two and sometimes three submarines available to the Fleet Commander for tasking at any one time.

The Coles Review proposed transition to a 'single-stream full-cycle docking' involving ten years of in-service operation followed by a two-year full-cycle docking.

While the new in-service ten-year period will include longer intermediate-docking periods to account for the reduction in full-cycle docking duration, the result would be a consistently higher level of availability overall, extending the duration of operational periods.

Over the long term, the 'single-stream full-cycle docking' means that Defence can plan on having three and sometimes four submarines available to the Fleet Commander for tasking at any one time from 2016–17.

ASC has proposed an immediate transition beginning with HMAS *Farncomb* in mid-2014. ASC has assessed that the immediate transition proposal lowers the risks associated with the progressive transition suggested by the Coles Review, particularly the risks related to funding requirements, the time required to re-allocate labour, workscope adjustments and managing the overall program to deliver availability. The Government has agreed to ASC's recommendation.

Under the immediate transition, HMAS *Collins*, which is currently undergoing pre-full-cycle docking preparation in Adelaide, will remain in Adelaide until completion of full-cycle docking in mid-2018. During this period, all pre-full-cycle docking preparation on HMAS *Collins*, including remediation of a class-wide main motor defect, will be completed. HMAS *Collins* will commence her two-year full-cycle docking in 2016.

Defence will closely monitor ASC's implementation of the new full-cycle docking maintenance regime and provide regular reports to Government through the Minister for Defence and Minister for Finance.

AMCS wins Pacific Patrol Boat Training Contract

In June the Minister for Defence Materiel, Mike Kelly, announced the signing of a $21 million four-year contract with AMC Search Ltd (AMCS) to provide Pacific Patrol Boat (PPB) training services. AMCS is the commercial arm of the Australian Maritime College, located in Launceston, Tasmania.

"The contract is for a range of technical, operational and administration courses for students from the 11 nations participating in the PPB Program," Dr Kelly said.

"An annual suite of 16 separate training programs are to be delivered in Launceston.

"Courses will range in duration from 10 days to 12 weeks and AMCS will also deliver some training in individual countries.

"It is anticipated that approximately 140–160 students will undertake training each year.

"The PPB Program remains the centrepiece of the Defence Cooperation Program in the South Pacific," he said.

In addition to training delivery and assessment, AMCS will also provide 24 hour support to all PPB trainees.

Training provided to Pacific crews by Launceston's Australian Maritime College builds a range of core skills, including maritime technical, seamanship, communications, search and rescue, navigation and management courses.

Australia proposes to replace the current Pacific patrol-boat fleet from 2018 over a period of 10 years.

In addition to the training program, Australia continues to provide a range of support services including the conduct of refits, engineering and technical services and logistic support.

Phased-array Radar Development

In May the Department of Defence released a Request for Tender to CEA Technologies for the development of a high-power phased-array radar concept demonstrator.

CEA Technologies Pty Ltd is a Canberra-based company whose world-leading technology CEAFAR radar is being fitted to the Anzac-class frigates of the Royal Australian Navy as part of the Anzac-class Anti-Ship Missile Defence Upgrade project.

"This tender is for the development of radar systems based on the CEAFAR radar which could support future naval acquisitions such as the Royal Australian Navy's future frigates through Project SEA 5000," the Minister for Defence Materiel, Mike Kelly, said.

"The initial part of this investment is anticipated to be in the order of $4 million dollars."

The CEAFAR radar is a focus of the phased-array radar element of the High Frequency and Phased Array Radar Priority Industry Capability (PIC).

The development of high-power phased-array radar based on the CEAFAR radar system will build on the already substantial investment made by the Australian Government in the domestic radar-related industrial research and development and de-risk radar solutions for the future frigates.

LHD and AWD Facilities Underway

Baulderstone Pty Ltd will be appointed to manage the construction of new and refurbished sustainment facilities in Sydney for the Royal Australian Navy's new air-warfare destroyers and landing helicopter dock ships.

In announcing the decision in July, the Parliamentary Secretary for Defence, Senator David Feeney, said that the $109.9 million AWD and $60.3 million LHD Sustainment Facility projects will provide berthing infrastructure, permanent maintenance and systems support facilities for the new ships at Garden Island in Sydney, and training facilities at Randwick Barracks and HMAS *Watson*.

Construction began in late July 2013 and is to be completed by late 2015.

HMAS *Canberra*, the first of the new LHDs, is due for delivery in early 2014 and HMAS *Hobart*, the first of the new air-warfare destroyers, is due for delivery in early 2016.

Garden Island's Crane to be Scrapped

The hammerhead crane is to be removed from the Garden Island dockyard in Sydney. On 8 August the Parliamentary Secretary for Defence, Senator David Feeney, said that the Department of Sustainability, Environment, Water, Population and Communities had approved the removal of the crane.

"Removing this crane will eliminate the safety risk it currently poses to Royal Australian Navy personnel, and will allow Navy to use Garden Island to its best possible advantage," Senator Feeney said.

The conditions of approval require the heritage value components of the crane to be identified and salvaged. An archival record will be made of the crane and its history will be documented in a Heritage Interpretation Plan.

"Garden Island has a rich heritage spanning over 100 years.

"This heritage is carefully maintained by Defence to ensure a balance between the protection of historic heritage values, and maintaining the operational effectiveness of Garden Island in supporting the fleet. The removal of the crane heralds a new era for Garden Island as it becomes home to the Navy's new large amphibious ships, the first of which is due to arrive in late 2013," Senator Feeney said.

Defence intends to proceed swiftly to address the conditions

The foremast for the RAN's first air-warfare destroyer, the future HMAS *Hobart*, arriving at ASC Adelaide recently
(Photo courtesy AWD Alliance)

A 136 t superstructure block being erected on the future HMAS *Hobart*
(Photo courtesy AWD Alliance)

of approval. Information will be published on the Defence website as this activity progresses.

The decision to remove the crane comes after a thorough environmental impact assessment which considered heritage impacts and included public consultation.

Built in 1951, the Hammerhead Crane was capable of lifting 250 tonnes at its peak. It has not been used since 1996.

Accommodation Contract for AWDs

The Australian engineering company, Taylor Bros, has been awarded a $15 million contract for the installation and fitting-out of the living spaces for the three air-warfare destroyers which are under construction in Adelaide.

Air Warfare Destroyer (AWD) Alliance CEO, Rod Equid, said that the contract demonstrates how the project is continuing to offer economic benefits by providing valuable work for businesses in the supply chain.

"The awarding of work to fit out the living spaces within the ships shows progress on the project as the Alliance moves into the consolidation and integration phase. Consolidation of the first destroyer is well advanced and fabrication work is also underway on ships two and three," Mr Equid said.

"Taylor Bros is an icon in Tasmania's shipbuilding industry and is delivering a range of accommodation products to the project including cabin modules, on-board furniture and galley, pantry, refrigerated spaces and laundry equipment for all three ships.

"This latest contract will put Taylor Bros to work within the interior compartments of the ship to fit and install the accommodation equipment in order to create comfortable spaces for our future sailors to live and work."

The contract will create jobs for up to 20 new fit-out specialists in South Australia with assistance provided by Taylor Bros' Hobart facility. This adds to more than 2500 people working directly on the project including engineers, naval architects, project managers, welders, electricians, designers and support staff.

Taylor Bros' Director, Phillip Taylor, welcomed the announcement, saying that this contract will provide another avenue of opportunity outside of Tasmania which is extremely important to the long-term prosperity of the company.

"This is an exciting opportunity for us, working in the Naval Defence industry at a time when local projects are scarce. It will ensure that we have ongoing involvement with the AWD Project through to the final acceptance by the Commonwealth in 2019," Mr Taylor said.

The contract with Taylor Bros, signed by ASC on behalf of the AWD Alliance, includes fitting out the sleeping quarters, sanitary spaces and mess and living rooms for junior and senior sailors and officers.

Work will begin on installing the prefabricated officers' accommodation and Chief Petty Officers' cabins leading into the cool and cold rooms, galley and pantries. Further work installing the laundry, junior sailors' and medical compartments will continue once the ship is in the water. Other service compartments they will work on include the sick bay, examination and treatment rooms, supply storerooms and scullery for all ships.

Navies sign Submarine Rescue Arrangement

On 15 May the Royal Australian Navy (RAN) signed an arrangement with the Republic of Singapore Navy (RSN) during the International Maritime Defence Exhibition and Conference (IMDEX) in Singapore.

Chief of Navy, Vice Admiral Ray Griggs, who signed the agreement with his Singaporean counterpart, Rear Admiral Ng Chee Peng, said that the Submarine Rescue Support and Cooperation Arrangement was developed between the RAN and RSN to enhance submarine rescue system availability between both navies.

"Having the arrangement in place will assist in facilitating an Australian request to Singapore for support if ever required in areas within the reach of the Singaporean submarine rescue system," Vice Admiral Griggs said.

The arrangement also allows for familiarisation visits between the two Navies to ensure interoperability of these important systems.

"This will ensure the compatibility of our systems, procedures and documentation, and establishes a framework for the conduct of future submarine rescue exercises at sea," Vice Admiral Griggs said.

Submarine Technology Agreement

In May the Minister for Defence, Stephen Smith, welcomed the agreement reached by Australia and Sweden in relation to intellectual property rights for submarine design and technology.

"Following extensive negotiations between the Defence organisations of the two countries, I am confident that this agreement will pave the way for Swedish involvement in Australia's future submarine program and also assist Australia with the ongoing sustainment of the Collins-class fleet" he said. "This agreement gives effect to Australia's rights to use and disclose Swedish intellectual property rights for complex submarine design and technology.

"Defence materiel cooperation has been a key feature of the Sweden–Australia relationship, most notably in the area of submarine technology where our collaboration over the construction and support of the Collins submarines has spanned two decades and, more recently, with the vital 'sense and warn' capability provided to protect our troops in Afghanistan. This mutually-beneficial relationship is expected to continue into the future."

The Australian Government had previously announced that it was considering four broad options for a fleet of future submarines to replace the current Collins-class submarines which are in service with the Royal Australian Navy. The 2013 Defence White Paper, released on 3 May, has focussed future work on two of these options, namely:

- an evolved design which enhances the capabilities of existing off-the-shelf designs, including the Collins class; and
- an entirely new developmental submarine.

In May 2012, the Australian Government announced that it would engage Swedish ship designer and builder Kockums AB, the original designer of the Collins-class submarine, to undertake initial design studies for the evolved Collins.

An evolved design would build on the high level of capabilities of the existing Collins-class submarine design, address known deficiencies and obsolescence issues and provide potential capability enhancements.

A precursor to this engagement with Kockums AB was the need to reach agreement with Sweden on the use of Collins-class submarine technology for the future submarine program, and to agree a framework and principles for the negotiation of intellectual property rights for Australia to be able to utilise other Swedish submarine technology for the future submarine program, if Australia decides to proceed with an evolved-Collins solution.

The ability for Australia to utilise Swedish submarine technology is a critical element not only of the work on the future submarine program, but also in addressing the continuing challenges with the maintenance and sustainment of the Collins-class submarines through to the end of their service life. This new agreement replaces the Commonwealth's existing rights as established by the licence agreement struck in June 2004.

The ability for Sweden to ensure that any arrangement did not compromise its sovereignty and ensured compliance with export control and security legislation was also paramount in the negotiated outcome.

Austal USA Activity

The last few months have been busy for the shipbuilders at Austal USA's yard at Mobile, Alabama.

On 20 May a keel-laying ceremony was held for the fourth Joint High Speed Vessel (JHSV) of a series of ten on order for the US Navy. On completion, the 103 m *Fall River* (JHSV 4) will be operated by the US Navy's Military Sealift Command. Fabrication of JHSV 4 began in May 2012. By the time of the keel laying all 43 of the modules from which the ship will be assembled were under construction.

USNS *Choctaw County* almost complete
(Photo courtesy Austal)

On 5 June the launching of the third JHSV, USNS *Millinocket*, was completed. The launch of *Millinocket* was conducted in a multi-step process which involved using self-propelled modular transporters (SPMTs) to lift the entire 1600 t ship almost 1 m in the air and moving the JHSV approximately 120 m onto a moored deck barge adjacent to the assembly bay. The deck barge with *Millinocket* onboard was then towed down river to BAE Systems' Southeast Shipyard. The vessel was transferred to *Drydock Alabama*, BAE's floating dry dock. The floating dry dock was submerged and *Millinocket* entered the water for the first time. USNS *Millinocket* was taken from the dry dock and towed back up river to Austal USA's facility, where she will undergo final outfitting and activation before sea trials and delivery to the US Navy later this year.

On 6 June the second JHSV, USNS *Choctaw County*, was delivered to the US Navy, exactly six months after the first of the class, USNS *Spearhead*, was handed over. *Choctaw County* completed acceptance trials during May.

On 25 June Austal held a keel-laying ceremony for the fourth Independence-class Littoral Combat Ship (LCS), the future USS *Montgomery* (LCS 8). Austal has a $US3.5 billion contract to build ten of these unusual ships for the US Navy.

USNS *Millinocket* emerging from Austal's construction hall
(Photo courtesy Austal)

Incat High-speed Ferry Completed

Incat Tasmania's world-first high-speed dual-fuel vehicle and passenger ferry is now officially fast with a trial lightship speed of 58.1 kn, a thrill for the designers of the 99 m high-speed vessel *Francisco* (Incat hull 069).

Incat claim that she is the fastest ship in the world, certainly nothing that could carry 1000 passengers and 150 cars, and with an enormous duty-free shop on board, could exceed that speed.

In June, during trials at a displacement of 1516 t she achieved 51.8 kn at 100% MCR operating with one turbine on LNG and one on marine distillate, exceeding the results achieved earlier in the month when *Francisco* comfortably exceeded 50 knots at full power with full ballast and maintained a steady 49 kn at 90% power while operating on marine distillate.

On Saturday 15 June, with the water ballast removed, and with both port and starboard gas turbines operating on LNG, *Francisco* achieved 58.1 kn at 100% MCR.

The vessel's high speed can be attributed to the combination of Incat's wave-piercing catamaran design, the use of lightweight, strong marine-grade aluminium and the power produced by the two 22MW GE LM2500 gas turbines driving Wartsila LJX 1720 SR waterjets. The extensive and luxurious interior made significant increases to the weight of the interior fitout; however, the Incat team worked diligently to maximise weight savings during construction wherever possible.

Francisco has been constructed for South American company Buquebus, for service on the River Plate, between Buenos Aires, Argentina, and Montevideo, Uruguay.

Incat is still not claiming 58.1 kn as the end point of lightship trials as there was a full load of LNG on board (two 40 m^3 tanks) in addition to about 35 t of marine distillate, with Incat Chairman Robert Clifford, saying "When we have less fuel on board, and delivery spares removed, we will see that speed go higher still in the shallow waters of the River Plate (Rio de la Plata). We are delighted with the efficiency of the design and sure that our customer, Buquebus, will be pleased with the results, enabling the ferry to compete with airline traffic on the River Plate route."

Buquebus Chairman, Juan Carlos Lopez Mena, recently announced that the vessel will be named *Francisco*, in honour of the Argentinian-born Pope Francis. The President of Argentina, Christina Fernandez de Kirchner, will christen *Francisco* following the ship's arrival in Argentina.

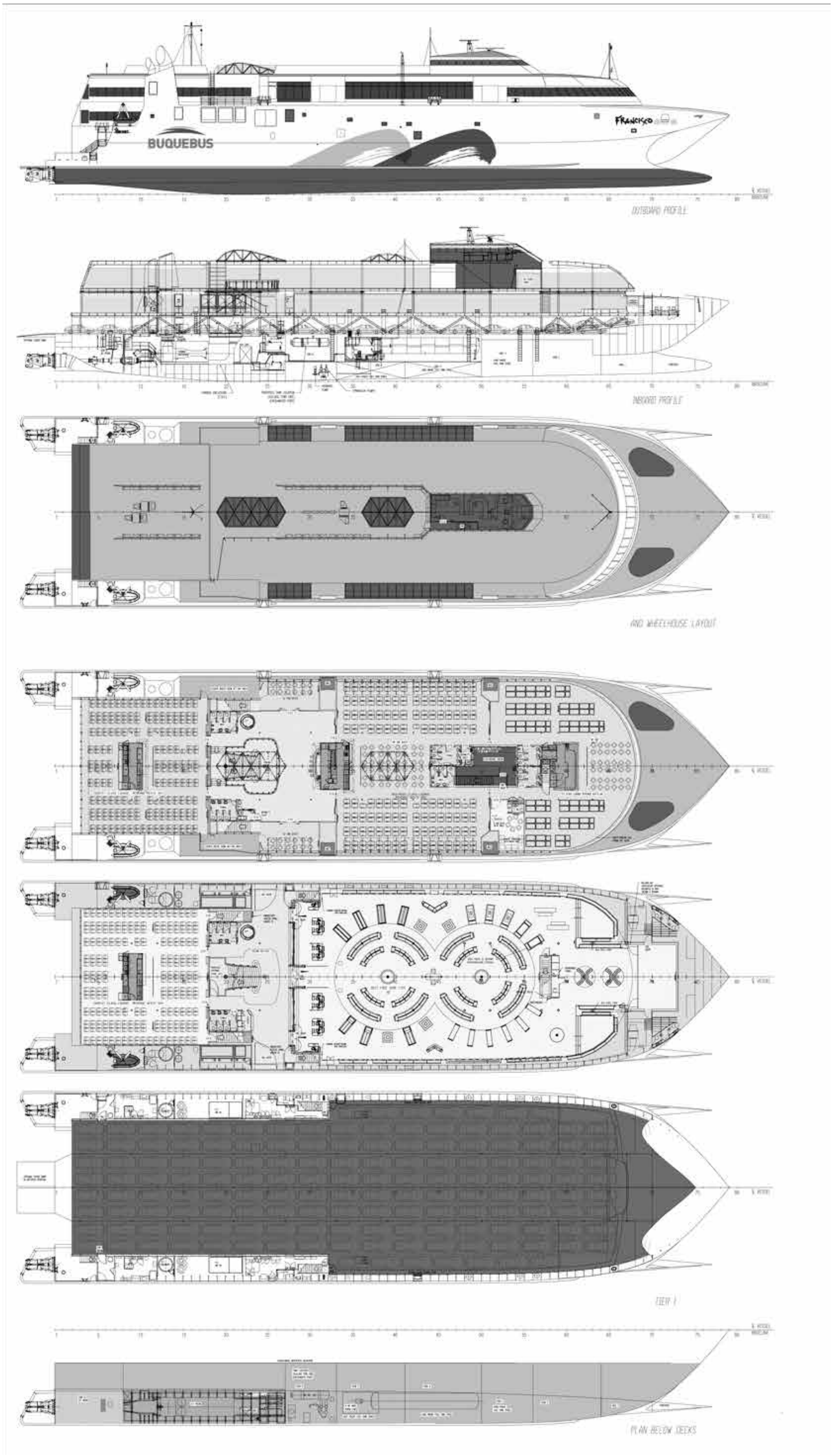
Francisco has capacity for 1000 persons and 150 cars. A luxurious fit out has been incorporated, including a 1100 m^2 duty-free shop.

Buquebus has clearly demonstrated their preference for Incat technology over a twenty-year period, and *Francisco* is the eighth Incat vessel to be operated by Buquebus and their associated companies. She will be the largest catamaran they have operated, the world's first dual-fuel high-speed ferry to operate on LNG as its primary fuel, and the fastest, environmentally cleanest, most efficient, high-speed ferry in the world.

The fastest previous vessel built by Incat was *Juan Patricio*, also delivered to Buquebus, with a top speed of 53.8 kn. *Juan Patricio* was delivered in 1996 and remains in commercial service.

Francisco is the fourth Incat-built vessel with a service speed of over 50 kn. Incat has built 25 high-speed craft over 5000 GT with a top speed in excess of 45 kn.

Francisco at speed during trials
(Photo by Robert Heazlewood, courtesy Incat Tasmania)



General Arrangement of *Francisco*
(Drawing Courtesy Incat Tasmania)

General Particulars of ***Francisco***

Length OA	99.00 m
Length WL	90.54 m
Beam OA	26.94 m
Draft (design)	2.98 m
Deadweight	450 t
Speed	47 kn at 450 t dwt, 100% MCR

Capacities

Passengers and Crew

Total 1024 max.

Tier 2 Passenger Deck is divided into three areas as follows:

Aft Lounge (Economy Class) with seating areas and Bar/Kiosk, Duty Free Shop and lobby with male and female toilets

Tier 3 Passenger Deck is divided into four areas as follows:

Aft Lounge (Tourist Class) with seating areas and Bar/Kiosk, Main Foyer with Reception Area, Business Lounges (P&S), male and female toilets and disabled toilet/mothers' room

Mid Lounge (Business Class) with seating areas and Bar/Kiosk, male and female toilets.

Forward Lounge (First Class) with seating areas, Bar, VIP Lounge and male and female toilets.

The Tier 4 wheelhouse and Tier 3 lower wheelhouse are accessed from the T3 forward zone.

Vehicle Capacity 150 car spaces at 4.5 m long × 2.3 m wide
Vehicle deck clear height 2.3 m
Vehicle deck axle load 2.0 t per axle

Vehicle Access Via shore-based stern ramps across transom.

Construction

Design — Two slender, aluminum hulls connected by a bridging section with centre bow structure at the forward end. Each hull is divided into nine vented, watertight compartments divided by transverse bulkheads. Two compartments in each hull are prepared as fuel tanks with an additional compartment prepared as a long-range tank.

Air Conditioning

Reverse-cycle heat pump units throughout, capable of maintaining 20–22° C and 50% RH with a full passenger load and ambient temperature of between 0° C and 35° C and 60 % RH.

Safety and Evacuation

Four Marine Evacuation Stations (MES), two port and two starboard, each capable of serving a total of up to 256 persons. A total of nine 128-person open reversible life-rafts are fitted.

Machinery

Gas Turbines	Two GE Energy LM2500 marine gas turbines, each 22 MW.
Water jets	Two Wartsila LJX 1720 SR waterjets configured for steering and reverse
Gensets	4 × Caterpillar C18, each 340 kW
GT service Gensets	2 × Caterpillar C9 200
Trim Control	Hydraulically-operated trim tab at the aft end of each hull

Liquids

Fuel Oil	2 × 70 000 L (approx. main tanks) 2 × 1240 L (gen. header Tanks)
LNG	2 × 40 m^3
Fresh Water	1 × 5000 L
Black and grey water	1× 5000 L
E/R oily water	2 × 160 L
Bilge holding	1 × 1,000 L
Aft hydraulic oil	2 × 400 L
Fwd hydraulic oil	1 × 200 litres

Hydraulics Three hydraulic power packs, one forward and two aft, all alarmed for low level, high temperature, filter clog and low pressure, supply hydraulics for capstans, trim tabs, steering and stern ramp.

Electrical

Distribution 415 V 50 Hz 3-phase four-wire distribution with neutral earth allowing 240 volt supply using one phase and one neutral. Distribution via distribution boards adjacent to or within the space they serve. 200 A 415 V 3-phase shore-power connection point fitted in starboard anteroom.

Design

Designer	Revolution Design Pty Ltd.
Class Society	Det Norske Veritas
Certification	DNV ✠ IAI HSLC R4 CAR FERRY B GAS FUELLED EO

New Contract for Incat Tasmania

Incat Tasmania Pty Ltd has secured a contract for the construction of a fast 70 m crew support vessel for operations in the Caspian Sea oil industry in Azerbaijan.

The contract was signed on 1 August in Baku, Azerbaijan, by Incat Chairman, Robert Clifford, and representatives of Caspian Marine Services.

Robert Clifford said "At 70 m length and 30 kn speed we expect that this will be the largest fast crew-transport vessel operating in the global oil industry, and Incat envisage an expanding market for this type of vessel."

Delivery will be at the end of September 2014, so design work is well advanced, ordering of materials and equipment is underway and construction of the ship will commence later this month.

The vessel will be delivered via the Volga-Don Canal to the Caspian Sea, Azerbaijan.

SP Mercury from Alloy Boats

Alloy Boats in Malaysia has handed over the first prototype Seabus vessel, *SP* Mercury, to a Malaysian company with the intention of on-going production in Indonesia. The Seabus concept is the latest variant of the original Sea Truck concept which has been used in the Indonesian oil industry for several decades, the original vessels being around 9–10 m in length and constructed from GRP.

It became a requirement that all new vessels had to be constructed in aluminium, hence the re-badging from Sea Truck to Seabus. Many builders and operators have tried to come up with a successful formula over the past decade, but have struggled to change their mindset. Most of the original Sea Trucks were simple vessels, often with semi-enclosed cabins. They used commercially-available high-speed marine diesels (automotive variants) running at light-duty ratings and driving under-sized waterjets. The combination proved to be consistently unreliable—the lightweight engines running at light-duty commercial ratings do not last long when used day-in, day-out, and often are not designed to be re-built. The use of under-sized waterjets running at contract speeds in the low 20 kn range had everyone clapping on day one, and pulling their hair out by week three.

The general Seabus requirement is for a passenger capacity of between 9 and 12 seated in an air-conditioned cabin, light cargo area (up to 1 t) and, preferably, a toilet. The minimum cruise speed of 20 kn and desire for medium- to heavy-duty engines and waterjets drives the hull design. Most builders and operators have opted for short vessels (hull length around 9–10 m), but without the ability to carry the 12 passengers, toilet and heavy-duty engines efficiently.

SP Mercury on trials
(Photo courtesy Alloy Boats)

Cabin interior on *SP Mercury*
(Photo courtesy Alloy Boats)

The new Alloy Boats design goes in the opposite direction, having a 12 m hull length and similar waterline length. The engines selected were Doosan L086, an 8.1 L model with a continuous rating of 210 kW at 2100 rpm. The engines have mechanical governing and so are far easier to maintain in remote areas. It is normal for customers in this region to specifically request engine options which avoid electronics. The engines are coupled via ZF gearboxes to Doen DJ120 jets which have been re-configured without thrust bearings or cardan shafts and drive directly onto the gearboxes—an option of the larger Doen jet models. This axial-flow jet has a 310 mm impeller, compared to the standard Seabus/Sea Truck vessels which have a 270 mm diameter impeller, giving effectively 30% greater nozzle area. The direct thrust variant requires the use of PTO-driven hydraulics (via the gearbox PTOs), improving reliability.

The concept has proven to be successful. During trials the maximum speed recorded at full load was in excess of 28 kn and the minimum cruise speed of 20 kn was reached at only 60% power. The fuel consumption at cruise is less than the charterer's requirements. This is also the first vessel to meet the charterer's cabin noise limits, thanks to a considerable quantity of insulation and the longer hull length.

Principal particulars of *SP Mercury* are

Length OA		13.0 m
Length hull		12.0 m
Beam moulded		3.30 m
Draft		0.60 m
Displacement	(light)	7800 kg
	(loaded)	9600 kg
Fuel oil		840 L
Fresh water		100 L
Main engines		2×Doosan L086TIM
		each 210 kW at 2100 rpm
Gearboxes		2×ZF 286 ratio 1:1
Waterjets		2×Doen DJ120 DT
Speed	(cruise)	20 kn
	(maximum)	28 kn at full load
Range		240 n miles at 20 kn

Greg Cox

Two 17 m Crew Transfer Vessels from One2three Naval Architects

One2three Naval Architects and Evolution Commercial have delivered two 17 m crew-transfer vessels (CTVs) to the Saipem Leighton Consortium. The vessels will run transfer operations out to Barrow Island as part of the Gorgon Project in the north-west of WA.

The CTVs were successfully built to a very tight delivery schedule — just four months from concept to delivery of the first vessel! This was partly made possible by One2three's use of the ShipConstructor software to deliver cut files in just two weeks.

The vessel configuration is based on crew transfer, with each vessel capable of carrying 36 passengers up to 100 n miles offshore. Rugged fendering is provided at the bow and stern to allow transfer at either end of the vessel to offshore assets.

The CTVs are powered by twin Caterpillar C18 engines at 651 kW brake power with ZF500 gearboxes driving Rolls Royce 36A3 waterjets. On trials, the first vessel met the contract speed of 25 kn at 67% MCR whilst fully loaded. Top speed was 32 kn in this condition with very low wash and clean spray off the forward spray chines. The vessels have been accepted into NSCV Class 1B (100 n miles) survey under the WA DoT with structural design to Lloyds SSC G3.

Principal particulars of the new vessels are

Length OA	20.1 m
Beam moulded	6.00 m
Passengers	36
Crew	2
Fuel oil	2×2000 L
Fresh water	1×1000 L
Sullage	1×1000 L
Main engines	2×Caterpillar C18 each 651 kW
Gearboxes	2×ZF500
Waterjets	2×Rolls Royce 36A3
Speed (67% MCR)	25 kn
(maximum)	32 kn
Survey	NSCV Class 1B

Leicon CTV 9 on trials
(Photo courtesy Mark Stothard)

Isle of Mahe from One2three Naval Architects

Aluminium Boats Australia have recently delivered *Isle of Mahe*, a luxurious 35 m catamaran ferry to a design by One2three Naval Architects for operation by Cat Cocos–Inter Island Boats in the Seychelles.

Featuring extensive use of stainless steel and floor-to-ceiling windows, the vessel configuration allows for up to 450 passengers to be carried in comfort, spread over three decks. The main deck comprises 222 seats surrounding a large central kiosk. Hidden divisions are in place to separate the cabin into smoke zones. Floor-to-ceiling windows provide ample viewing opportunities. At the rear of the passenger area are toilet facilities and a huge walk-through luggage space, with roller doors port and starboard leading to dedicated luggage gates and ramps for ease of loading.

Stepping upstairs, the vessel has 22 first-class seats located behind the wheelhouse, with a dedicated bar service and separate bathroom. Seats are full leather reclining Beurteaux Executives arranged in groups of two.

The most-popular seats, being always sold out first, are the external seats fitted to the upper or "Island Hopper" deck. This expansive area covering 15 m × 9 m has undercover seating for 143 guests. Another large bar/servery is located at the forward end of this deck, backing onto the first-class cabin's aft bulkhead. Toilets are also provided on this deck.

Heading up to the third deck, passengers are greeted with 360-degree views to the horizon whilst seated under cover beneath a targa arch and canopy. The "observation" deck seats an additional 72 guests.

Powered by 16V2000 MTU engines rated at 1440 kW brake power, the vessel achieved her cruising speed of 26 kn at less than 65% MCR fully loaded. Top speed is in excess of 32 kn.

Isle of Mahe has DNV classification plan approval to 1A1 HSLC R3 Passenger and was delivered in NSCV survey as a Fast Craft under authorisation from Seychelles Maritime Authority.

Principal particulars of *Isle of Mahe* are

Length OA	36.0 m
Length measured	34.9 m
Beam moulded	9.6 m
Passengers	450
Crew	10
Fuel	2×5500 L
Fresh water	1×1200 L
Sullage	1×1200 L
Main engines	2× MTU 16V2000 each 1440 kW
Speed (65% MCR)	26 kn
(maximum)	32 kn
Survey	DNV 1A1 HSLC R3 Passenger

Main deck on *Isle of Mahe*
(Photo courtesy One2three Naval Architects)

Isle of Mahe on trials
(Photo courtesy One2three Naval Architects)

Wheelhouse on *Isle of Mahe*
(Photo courtesy One2three Naval Architects)

Kingfish from One2three Naval Architects

Following just nine days after loading *Isle of Mahe* onto MV P*atria* (a 102 m ro-ro cargo vessel) for delivery to the Seychelles, Aluminium Boats Australia launched *Kingfish*, a 24 m One2three-designed catamaran ferry for Cruise Whitsundays.

Kingfish was commissioned as a purpose-designed ferry for Whitsundays operation. She fulfils a range of roles depending on the season and services the various Whitsunday Island Group resorts. Her first run of the day is a "staff" run, delivering up to 200 day workers to respective resorts. During the day *Kingfish* can operate reef tours out to a dedicated Cruise Whitsunday pontoon for a day of water-based leisure activities including snorkelling, diving and of course, dining. When not operating as a reef tourist vessel, *Kingfish* operates a house-guest ferry service, taking guests and their luggage to various destinations. The aft deck is hence dedicated open space for luggage trolleys, via dedicated luggage ramps and gates.

Passenger boarding gates deliver guests to the main cabin, with seating for 115 passengers arranged in a 3–4–3 fashion. Tables are arranged throughout the main cabin for approximately 50% of guests to function for reef dining and to enable charter/function operations when required. A large kiosk is located at the aft end of the cabin, with an island bar and ice-cream display freezer placed in front of the kiosk servery.

A further 87 passengers are seated on the upper deck , with a large canopy providing protection from the elements. Seating is arranged in conversational groups with tables scattered throughout the open spaces.

A pair of Caterpillar C18 engines rated at 500 kW brake power at 2100 rpm drive Veem propellers via ZF500 gearboxes. By removing the pitch-adjusting strips in the Veem propellers, the engine power is limited to 95% at full rpm when the vessel is fully loaded. In this condition *Kingfish* achieved 24 kn full of fuel, luggage and 200 passengers. Maximum speed is limited to 25 kn.

Principal particulars of *Kingfish* are

Length OA	25.0 m
Length measured	23.9 m
Beam moulded	7.60 m
Passengers	200
Crew	3
Fuel	2×2500 L
Fresh water	1×550 L
Sullage	1×550 L
Main engines	2×Caterpillar C18
	each 500 kW at 2100 rpm
Gearboxes	2×ZF500
Propellers	2×Veem
Speed (loaded)	24 kn
(maximum)	25 kn

Rob Tulk

Kingfish on trials
(Photo courtesy One2three Naval Architects)

Cobia from Incat Crowther

Incat Crowther has announced the delivery of *Cobia*, a 24 m catamaran built by Aluminium Marine in Brisbane. *Cobia* is the fourth vessel utilising the new-generation 24 m design, following on from *Fantasea Sunrise*, *Freedom Sovereign* and *Riverside Avalon*. The design, featuring modern sleek styling, efficient construction, and a robust and stable hull, has been utilised for a number of Queensland operations, with the vessels proving successful in the Whitsundays, Yeppoon and Gladstone.

Cobia seats 124 passengers in her main-deck cabin, with a large bar/kiosk located aft. Three toilets are located across the aft end of the deck, one of which is wheelchair accessible. Entry and egress are aided by a pair of midship boarding doors, in addition to the stern gates. 44 passengers are accommodated in the upper-deck cabin, with 26 outdoor seats aft. An additional WC is located in the aft end of the upper deck cabin.

Cobia also features structure for a lifting stern platform, allowing for the simple retrofit of such a feature at a later date.

The vessel is fitted with a pair of Yanmar 6AYM-GTE main engines, driving a pair of 5-bladed fixed-pitch propellers. Capable of speeds in excess of 27 kn, *Cobia* easily achieved her loaded service speed of 25 kn at 85% MCR on recent sea trials.

Offering class-leading efficiency and seakeeping, *Cobia* gives Cruise Whitsundays a versatile vessel built on a proven hullform which delivers comfort and efficiency.

Principal particulars of *Cobia* are

Length OA	24.0 m
Length WL	23.8 m
Beam OA	8.50 m
Depth	2.75 m
Draft (hull)	1.10 m
(propeller)	1.70 m
Passengers	194
Crew	5
Fuel oil	4000 L
Fresh water	500 L
Sullage	500 L
Main engines	2×Yanmar 6AYM-GTE each 618 kW @ 1900 rpm
Propulsion	2×propellers
Generators	2×62.5 kVA
Speed (service)	25 kn
(maximum)	27 kn
Construction	Marine-grade aluminium
Flag	Australia
Class/Survey	NSCV Class 1C

Cobia on trials
(Photo courtesy Incat Crowther)

SEACOR Lynx from Incat Crowther

Incat Crowther has announced the delivery of the first of two 58 m catamaran crewboats, *Seacor Lynx*. Built in Louisiana by Gulf Craft LLC to an Incat Crowther design, the third vessel in the SEACOR CrewZer series brings a new era of very fast crew boats, larger and faster, and offering increased levels of technology, capability, and comfort.

SEACOR Marine pioneered the use of large, fast catamarans in the offshore industry with the commissioning of the innovative *SEACOR Cheetah* in January 2008, and *SEACOR Cougar* in April 2009. The operator takes this evolution further with *SEACOR Lynx*, and sister ship *SEACOR Leopard*, currently nearing completion at Gulf Craft.

Benefitting from operational experience of *Cheetah* and *Cougar*, SEACOR has been delivered a vessel which offers substantial improvements in operational capability, both in terms of vessel motions which translates to crew comfort, and operational envelope. During the first few months of service, the vessel has operated confidently in very rough seas at full deadweight capacity, demonstrating a maximum deviation of only 0.5 m DP holding capability in a 3 m sea with 4 kn of cross current and a 20 kn breeze.

SEACOR Lynx is powered by four MTU 16V4000 M73L main engines, driving four Hamilton HT-810 waterjets. The vessel has a service speed of 40 kn with more than 120 t deadweight, and a top speed of 42 kn, allowing the vessel to service multiple deepwater installations with reduced transit times, and is a viable alternative to the much higher-cost option of helicopter transfer.

As with the *SEACOR Cheetah* and *Cougar*, the cargo deck is lined with hardwood inserts, and protected by heavy-duty cargo rails at the sides. An optional landing rig for surfer-class vessels can be fitted amidships. The vessel has the capacity to carry 150 t of deck cargo.

SEACOR Lynx on trials
(Photo courtesy Incat Crowther)

The combination of four reversing jets and two retractable azimuthing thrusters, coupled with a Kongsberg control system, provides the vessels with dynamic positioning in a wide operating area. *SEACOR Lynx* is the first crewboat with DP3 capability, offering the ability to stay on station even with the failure of any main component such as a main engine or thruster, reference system or fuel system, or loss of any compartment due to a fire or a flood.

The main cabin seats 150 in very spacious seating, whilst comfort is further enhanced with increased luggage space and additional toilets. The main cabin also houses a snack bar and coffee making facilities.

The upper-deck wheelhouse features forward- and aft-facing control stations. Outside are fire monitors and a rescue boat. As well as excellent forward and aft visibility, direct access is provided to the foredeck for quick and safe mooring operations.

SEACOR Lynx testing fire monitors
(Photo courtesy Incat Crowther)

The hulls accommodate 12 crew in a mix of officer and crew cabins. The port hull features galley and mess facilities.

SEACOR Lynx's stability is designed to fully comply with the IMO HSC code, giving regulatory versatility.

Incat Crowther is pleased to support SEACOR Marine with continued evolution of the CrewZer Class vessel.

SEACOR Lynx and *SEACOR Leopard* equip SEACOR to expand its capability and service offering.

Principal particulars of *SEACOR Lynx* are

Length OA	58.6 m
Length WL	53.6 m
Beam OA	12.5 m
Depth	4.30 m
Draft (hull)	1.70 m
Passengers	150
Crew	14
Fuel oil	109 100 L
Fresh water	17 500 L
Sullage	2700 L
Grey water	2700 L
Deadweight	195 t
Tonnage	497 GRT
Deck capacity	152.4 t
Deck strength	3.0 t/m^2
Deck length	26.2 m
Deck width	9.80 m
Clear area	260.3 m^2
Main engines	4×MTU 16V4000 M73L each 2880 kW @ 2050 rpm
Gearboxes	4×Twin Disc MGX62000 SC
Propulsion	4×Hamilton HT-810 waterjets
Speed (service)	40 kn
(maximum)	42 kn
Generators	2×Cummins QSM11 each 290 ekW
Bow Thrusters	2×Thrustmaster TH200-RN-AL
DP Capability	DP-3
Discharge rates	
Fuel oil	41 m^3/h @ 18 m
External fire fighting	2×FFS monitors, 2408 m^3/h total
Rescue Equipment	6-person RSQ NDM 440 FRC with SOLAS Davit
Ride control	Maritime Dynamics
Construction	Marine-grade aluminium
Class/Survey	ABS ✠ A1 HSC Crewboat ✠ AMS DPS-3 (fire fighting capability)
Flag	Marshall Islands

24 m Catamaran Patrol Vessel from Incat Crowther

Incat Crowther and Marine Engineering Consultants (MEC) have announced the commencement of construction of a 24 m long-range catamaran patrol vessel to work in the Great Barrier Reef World Heritage Area (GBRWHA). The GBRWHA is jointly managed by Queensland's Department of National Parks, Recreation, Sport and Racing (DNPRSR) and the Great Barrier Reef Marine Park Authority (GBRMPA).

Pivotal to winning the tender was Incat Crowther's experience in designing cost-effective, low environmental impact vessels and MEC's excellent build quality, value and support. MEC's successful partnership with Incat Crowther was recently showcased with the launches of *Riverside Avalon*, *Riverside Catalina* and *Riverside Mandalay*, and dates back to *Amaroo*, built in 2000.

Incat Crowther submitted a concept design to competitive tender, characterised by consideration for its operational environment and by the application of several new technologies. Incat Crowther was selected as the preferred designer on the basis of a superior hullform underpinning a rugged, versatile, cost-effective package. The design concept was used as the basis of a competitive build tender, with the build contract being awarded to MEC.

Among its environmental features, the vessel has extensive solar panels, high R-value insulation, zoned air conditioning, as well as window blinds and shutters to reduce the impact of the Queensland sun. The extensive solar array takes advantage of modern lithium-ion batteries to reduce the use of diesel generators, both in operation and whilst at anchor at night. The batteries are charged during the day by solar power, allowing the vessel's diesel generators to remain shut down overnight. At these times, the battery bank will supply power for house loads, including air conditioning. In the event of increased demand, the generators will automatically start. Depending on the load case, they will either provide direct power, or charge the batteries. This reduces running costs and will dramatically reduce the cost of maintaining the generators. The cost-effective nature of this configuration is further enhanced by the benefits of lithium-ion batteries. These batteries are a quarter of the weight, and can provide up to ten times the power and ten times the life cycle, of conventional lead-acid batteries.

The vessel's aft deck houses a cradle for a 6 m RIB, which is capable of being launched and retrieved at speeds of up to 6 kn and in seas up to 3 m. Dive-tank racks are provided, as are a pair of bench seats for dive preparation.

The main-deck cabin features a large wet room aft, with toilet, shower and laundry facilities. A large mess with seats for 15 is situated opposite a large galley. A large pantry adjoins the galley and houses provisions for long missions. Additional storage is provided in the bridging structure, accessed via removable floor panels. Forward of this is a second lounge area to starboard and a pair of computer workstations to port. There are two twin cabins forward with a bathroom, and doors to the side deck providing easy access around the vessel. Aft of the wheelhouse, the upper deck features two twin cabins, a bathroom, power-tools store and cold store.

The aft upper deck is divided in to two distinct spaces. Aft is a 4.5 m RIB with crane for launch and retrieval. This area also houses the vessel's cargo space, which is separated from the crew recreation space by cargo barriers. Forward of these barriers is an outdoor mess area with a barbecue. An additional 8 crew are accommodated in twin cabins in the hulls. Storage capacity is provided aft for 1500 L of unleaded petrol, for use on the RIBs.

Multiple drive-train options were evaluated, with hybrid propulsion options at the forefront. Long-term costs were taken into account, with the decision being to combine conventional diesels with supplementary solar panels and a highly-efficient hullform.

The vessel will be powered by a pair of Yanmar 6AYM-WGT engines, producing 670 kW each. Capable of speeds up to 25 kn, the vessel is optimised for efficient cruising between 12 and 20 kn.

Incat Crowther and Marine Engineering Consultants are pleased to be the team selected for this project. By offering strong commercial and engineering packages, combined with attentive, client-based service, the result is a balanced, cost-effective vessel. The vessel is due to be launched in early 2014.

Principal particulars of the new vessel are

Length measured		23.99 m
Length WL		24.79m
Beam OA		8.50 m
Depth		3.60 m
Draft	(hull)	1.30 m
	(propeller)	1.90 m
Crew		14 for Class 2B
		28 for Class 1C
Fuel oil		12 000 L
Fresh water		4000 L
Sullage		2000 L
Main engines		2×Yanmar 6AYM-WGT
		each 670 kW @ 1938 rpm
Propulsion		2×5-bladed propellers
Generators		2×Northern Lights M65C2
Solar panels		80 m^2/8 kW
Batteries		144.8 kWh lithium-ion
Speed	(maximum)	25 kn
	(service)	20 kn
Construction		Marine-grade aluminium
Notation		USL Code/NSCV
		Class 2B 14 pax
		Class 1C 28 pax

Starboard quarter of 24 m catamaran patrol vessel
(Image courtesy Incat Crowther)

24 m Catamaran Multi-role Wind Farm Support Vessel from Incat Crowther

Incat Crowther has announced its role in delivering the detailed design of an exciting new 24 m catamaran wind farm support vessel, the SMV 24, unveiled by Supacat at the Seawork exhibition in Southampton in late June. The new multi-purpose vessel is a fresh approach to the sector, offering unparalleled operational flexibility, comfort and safety. The new vessel is currently under construction at Mustang Marine in Wales, due for completion in September 2013. Designed to perform multiple wind farm and offshore maintenance roles, the vessel aims to achieve the goal of simplifying operators' fleets by offering a platform which can perform many roles.

Central to the innovative design is the high-capacity, pillar-free cargo deck, which is flat from stem to stern. With cabin and hull accesses located outboard, the deck will be fitted with a set of container rails running the full length of the vessel. The length of the cabin overhead is limited to allow vertical loading of containers up to 10 ft on the aft deck and up to 20 ft on the forward deck. Once on board, the containers can be moved forward and aft through the vessel. A deck crane mounted on a base frame can also be moved forward and aft on the rails.

Tie-down points are fitted throughout the deck to allow containers, cargo pallets and the crane to be secured in any location. Removable handrails will surround the deck, allowing safe passageways for personnel on both sides of the vessel, linking the forward and aft boarding points with access to the passenger cabin, wet room and accommodation spaces. A roller door mounted to the underside of the passenger cabin above allows the deck to be protected from the elements.

The upper-deck cabin will be resiliently mounted, enhancing passenger comfort. It will be fitted with 12 seats on sprung bases. Combined with fold-down tables, the seats offer flexibility, allowing personnel to relax in a forward-facing arrangement, or create booths around tables. In addition to the seating, the cabin will also house a lounge, galley and head. Interior bulkheads separating the passenger cabin from the access stairs and wheelhouse will be glazed to improve visibility for personnel.

The upper-deck wheelhouse is raised to improve visibility, both forward and aft. Skylights are fitted in the wheelhouse to give operators a view of turbines when docking.

Two crew are accommodated in cabins in each hull, each with a bathroom. These have dedicated access stairs, allowing them to be accessed internally from the upper-deck passenger cabin and the main-deck wet room.

The vessel will be powered by MAN V12 D2862 LE463 main engines, producing 1044 kW each and coupled to a pair of controllable-pitch propellers. The vessel will have a speed of 30 kn, whilst providing class-leading thrust for engaging with pylons due to CPP propulsion.

Designed with a robust hull with high freeboard, the vessel will offer excellent seakeeping, ensuring that personnel arrive at offshore destinations in good shape, and can transfer to installations in a safe manner.

Incat Crowther is part of a team created by Supacat which includes Mustang Marine and DNV who, together, have yielded an innovative concept which will offer greater flexibility in the way that operators deploy vessels to offshore destinations such as wind farms and other wider marine engineering tasks.

Principal particulars of the new vessel are

Length OA	25.6 m
Length WL	24.4 m
Beam OA	8.00 m
Depth	3.80 m
Draft (hull)	1.10 m
(propellers)	1.60 m
Personnel	12
Crew	4
Deck cargo	30 t (2×TEUs)
Fuel oil	12 000 L
Fresh water	500 L
Sullage	500 L
Main engines	2×MAN V12 D2862 LE463 each 1044 kW @ 2100 rpm
Propulsion	2×controllable-pitch propellers
Generators	2×Beta Marine 35 kW
Speed (service)	25 kn
(maximum)	30 kn
Construction	Marine-grade aluminium
Class/Survey	DNV 1A1 HLSC R1 Windfarm Service 1
Flag	UK MCA SCV Code Category 1

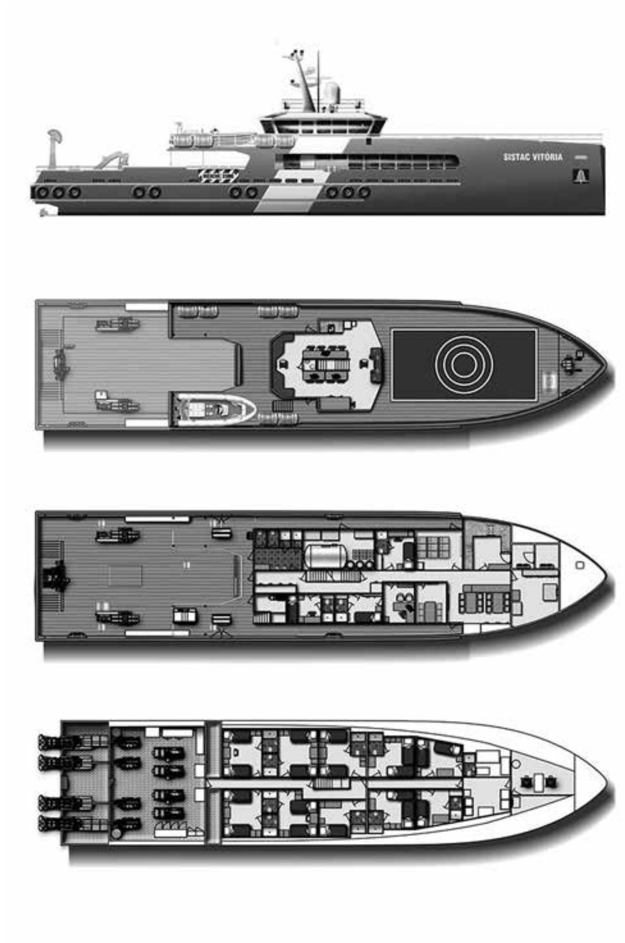
Starboard bow of 24 m catamaran multi-role vessel
(Image courtesy Incat Crowther)

42.5 m Monohull Dive-support Vessels from Incat Crowther

Incat Crowther has been contracted to design a trio of 42.5 m monohull dive-support vessels. The design is an innovative concept, born of the latest ideas from designer, builder and operator. The design has been developed from stem to stern to be a dedicated DP-2 capable dive-support vessel, featuring fully integrated ROV launch-and-recovery, dive compressors and decompression chamber.

The vessels, currently under construction at SeaSafe Barcos Manufaturados, in Angra do Reis, Brazil, will be delivered to Sistac. The first of the three vessels, to be named *Sistac Vitória*, is due to be delivered in the first quarter of 2014.

The aft deck will feature a large working deck, which will house the ROV crane and reel, a pair of dive platforms and



General arrangement of 42.5 m dive-support vessel
(Drawing courtesy Incat Crowther)

two deck cranes. Inside the main deck house are functional areas such as toilets and showers, dive shop (housing compressors and decompression chamber) and ROV shop. Forward of these spaces are an office, TV room, meeting room, mess areas, and two single-berth cabins for senior personnel and a designated officer cabin.

A spacious wheelhouse is located upstairs, with forward- and aft-facing vessel control stations, ROV and dive-control workstations. Overhead windows are fitted both fore and aft for high-angle visibility.

Below decks is accommodation for the remaining 33 crew members, in a mix of 2-, 3- and 4-berth cabins. All accommodation cabins feature their own ensuite bathrooms.

Four Scania D13 main engines, each producing 410 kW, will power the vessels. The vessels will have a service speed of 13 kn and a top speed of 15 kn.

The DP-2 capability ensures that the vessel can hold station in the event of a failure in any single component of the system, enhancing both safety and reliability.

As well as being efficient, the vessel's new-generation hullform will endow it with excellent seakeeping characteristics, enhancing the functionality of the vessel in offshore operations.

Incat Crowther's wealth of expertise will help deliver a unique design for dedicated, functional dive support vessel with high standards of dynamic positioning, seakeeping and crew habitability.

Stewart Marler

EDUCATION NEWS

Australian Maritime College

Symposium on Marine Propulsors

The Australian Maritime College and the University of Tasmania hosted the 3rd Symposium on Marine Propulsors in May 2013. The event attracted experts from around the globe to Launceston for this international symposium dedicated to the design and hydrodynamics of all types of marine propulsors.

AMC Principal, Prof. Neil Bose, said that the event attracted 100 delegates from across Australia and as far afield as Asia, Europe and the United States.

“This year’s symposium continues the work presented in 2009 and 2011 in Europe into all aspects of hydrodynamic design of marine propulsors,” Prof. Bose said in May.

Professor Neil Bose
(Photo courtesy AMC)

“A highlight was the sessions on Ocean Renewable Energy and Renewable and Low Environmental Impact Propulsion. With ever-increasing transportation demands and the growing need for reduced carbon footprints, it is imperative that we develop new and exciting ways to generate energy and minimise energy use for propulsion.

“I have no doubt that the work presented throughout this symposium will have resounding impact for many years to come.”

SMP 13 also included a mini symposium, the 3rd T-Pod — Technological Advances in Pod Propulsion, in which papers related to marine podded propulsors (those in which the propellers and their driving electric motors are placed in a pod below the hull of a ship) were presented.

The full papers are now available at https://app.certain.com/profile/web/index.cfm?PKWebId=0x3678222da1 and will be shortly transferred to the main SMP website at www.marinepropulsors.com/.

Alex Conway — PhD Student and Olympic Sailing Hopeful

Alex Conway is currently studying for his PhD in surface-piercing cylinders operating at high Froude numbers (otherwise known as periscopes). He has also been training to compete in the 2014 Olympics to sail in the 470 class and gained a placed in the Australian team touring Europe in June. The AMC is proud and happy to support Alex in this endeavour, granting him a leave of absence during this time and providing some sponsorship in his endeavour.

When last heard from on 26 July, Alex was in La Rochelle (the sailing Mecca of France) preparing for the world championships in August. As of July he has completed three regattas in Europe gaining invaluable international experience. Alex and his brother (another PhD student) scored a 13th at the Delta Lloyd regatta and a 17th at Kiel Week.

Defence Scholarship Winners

Academic excellence has paid off for two naval architecture students from the Australian Maritime College. Reuben Kent and Samuel Smith, both in their second year of Bachelor of Engineering studies, have each received prestigious awards as part of the Civilian Defence Engineering Scholarships Scheme (CDESS).

CDESS is offered by the Department of Defence to students in the second year 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 paid industry work placements within Navy and the Defence Materiel Organisation.

The award aims to attract talented 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.

Reuben Kent, Martin Grimm and Samuel Smith
(Photo courtesy AMC)

Reuben and Samuel were officially presented with scholarship certificates by Martin Grimm, the Principal Naval Architect from the Directorate of Navy Platform Systems, at a ceremony which was also attended by past AMC CDESS recipients Caitlin Hoey and Lauchlan Clarke.

Both Reuben and Samuel said that the scholarships would make a big difference, both financially and in terms of work placements. Caitlin and Lauchlan took the opportunity to share the benefit of their scholarship experiences with the pair.

Applications for the next CDESS round are expected to open to second-year naval architecture students in mid-2014.

Mark Symes

University of New South Wales

Undergraduate News

Inclining Experiment

The Sydney Heritage Fleet has recently acquired two of the 50 ft (15.24 m) harbour tugs, *Bronzewing* (501) and *Currawong* (502), which were designed and built in the late 1960s by Stannards at Berry's Bay for the Royal Australian Navy.

Sydney Heritage Fleet provided access *Currawong* for the naval architecture students in Year 3 to conduct an inclining experiment at Rozelle Bay on 2 May. The students conducted the experiment with the guidance of lecturer Mr Phil Helmore with surveyor Mr Dane Fowler. The day turned out perfect for an inclining, with almost no wind, and a glassy-calm sea. The operation included a check of the permanent ballast on board. The theory of stability is fascinating, but seeing it in practice at an inclining makes it come to life for the students.

Year 3 naval architecture students
on board *Currawong* at the inclining experiment
(Photo Phil Helmore)

Visit to HMAS *Melbourne*

On 29 May the Year 3 naval architecture students visited HMAS *Melbourne*, alongside at Fleet base East and busy working up for her forthcoming deployment to the Persian Gulf.

LEUT Curic welcomed us board and then introduced us to the operations of the Damage-Control Station and the Central Control Station. Our group of ten was then split into two groups, one guided by LEUT Rogerson and one by SBLT Dowling, for a tour of the ship. The group guided by LEUT Rogerson started by inspecting the bridge, where the Officer of the Watch explained the equipment and operations of navigating and conning the ship. The group then moved on and saw Auxiliary Machinery Room 1, the Junior Sailors' mess, the engine room with the gas turbines and main reduction gear, the Central Office Complex, the high point and probe fuelling for replenishment at sea, the steering-gear compartment, the stern gland, the Wardroom and officer country, the Close-In Weapons System, chaff launchers and flying-control positions, the foredeck and the Guided-Missile Launch System and Vertical Launch System, and anchoring arrangements. The students learned a whole range of terminology and came away with a better understanding of ship arrangements and the complexity of a modern warship. It was great to have ship's officers as the guides for the tour, and their explanations of the operations brought out the realities and practicalities which you don't get in the theory of naval architecture.

Year 3 naval architecture students
with lecturer Phil Helmore on board HMAS *Melbourne*
(Photo courtesy Syami Hashim)

Thesis Topics

Among the interesting undergraduate thesis projects newly under way are the following:

Investigation of Historic Vessel Bermagui

The Illawarra and South Coast Steam Navigation Company serviced the ports on the Illawarra and south coast of NSW for many years. There is interest in these ports in building models of the ISCSNCo vessels. TSS *Bermagui* was the first of the ISCSNCo vessels to be built by the Ailsa Shipbuilding Company at Troon in Scotland. Some drawings, including a general arrangement and structural details of *Bermagui* have been obtained from the National Maritime Museum in Greenwich, and the University of Glasgow, but these do not include a lines plan.

Li Chen is undertaking a project to search the literature for information on *Bermagui*, to find as many details as possible and to write up some of the history. The investigation will then concentrate on modelling the hull shape and deriving a lines plan from the information shown on the general arrangement and structural drawings to obtain the correct displacement. This will lead on to an investigation of the stability characteristics by way of a mass estimate and comparison with modern stability criteria (stability criteria were almost non-existent in her heyday!) and looking at resistance and seakeeping.

Graduation

At the graduation ceremony on 13 June, the following graduated with degrees in naval architecture:

William Birdsall Honours Class 1
Matthew Laverty Honours Class 2 Division 2
Elliot Thompson Honours Class 2 Division 2

Prize-giving Ceremony

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

The Royal Institution of Naval Architects (NSW Section) Prize for the best academic performance by a student in Year 1 of the Bachelor of Engineering program in Naval Architecture to Nazri Bin Mohd Fauzi.

The Royal Institution of Naval Architects (NSW Section) Prize for the best academic performance by a student in Year 2 of the Bachelor of Engineering program in Naval

Graduates Elliot Thompson (L) and Matthew Laverty
at UNSW Graduation Ceremony on 13 June
(Photo Phil Helmore)

Nazri Bin Mohd Fauzi with Alan Taylor and Head of School, Prof. Anne Simmons
(Photo courtesy Dianne Augee)

Georgia McLinden with Alan Taylor and Head of School, Prof. Anne Simmons

(Photo courtesy Dianne Augee)

Architecture to Syahmi Hashim.

The Royal Institution of Naval Architects (NSW Section) Prize for the best academic performance by a student in Year 3 of the Bachelor of Engineering program in Naval Architecture to Georgia McLinden.

These three prizes were presented by the Chair of the NSW Section of the Royal Institution of Naval Architects, Alan Taylor.

The Royal Institution of Naval Architects (Australian Division) Prize and Medal for the best ship design project by a student in the final year to William Birdsall for his design of a 33 m tug with 50 t bollard pull for handling vessels in the Port of Fremantle, WA, with occasional offshore towing or salvage operations.

The David Carment Memorial Prize and Medal for the best overall performance by a naval architecture student in the final year to William Birdsall.

These two prizes were presented to William by the Vice-President of the Australian Division of the Royal Institution of Naval Architects, Tony Armstrong, at the joint RINA/IMarEST technical presentation on Wednesday 17 July at the Flying Angel Club in Fremantle.

Congratulations to all on their fine performances.

Graduates Employed

Our 2013 graduates are now employed as follows:

William Birdsall International Maritime Consultants, Fremantle

Matthew Laverty Evaluating opportunities

Elliot Thompson Directorate of Navy Platform Systems, Canberra

Students-Meet-Industry Night

Around 200 students from the School of Mechanical and Manufacturing Engineering and the Graduate School of Biomedical Engineering attended a very successful Students-Meet-Industry Night in Building G23 (formerly the SIRF building) in early June. What made this event different to other career nights was the fact that it had been almost entirely organised by students.

Representatives of the student societies MechSoc and BESS were responsible for the planning and organisation of the evening, which included everything from contacting employers, sending out invitations, making name tags, and hosting on the night!

The result was a well-executed and successful function which attracted over 20 companies and professional organisations. Students were able to browse the company stands and find out more about graduate and vacation work programs. Several recent graduates shared their experience on life in the workplace and offered tips on how to make the most of an internship or graduate placement.

UNSW students-meet-industry night
(Photo courtesy Dianne Augee)

Post-graduate and Other News

Digital Teaching Innovation

Two UNSW academics have been awarded prestigious national learning and teaching grants to develop innovative digital teaching platforms. The grants are part of a $6.4 million funding round from the Federal Government's Office of Learning and Teaching, and were announced in early June by the Minister for Higher Education and Skills, Sharon Bird.

A/Prof. Ganga Prusty from the School of Mechanical and Manufacturing Engineering has received $250 000 for a project to develop a virtual workshop for engineering and design students. In 2012, A/Prof. Prusty won a national award for teaching excellence for his contribution to the development of online tutorials which adapt to the abilities of individual students and provide intelligent feedback to help them learn more effectively. These intelligent tutorials were developed in partnership with the UNSW spin-off company Smart Sparrow. The new workshop is based around this technology but will have an innovative educational element which caters to the unpredictable nature of testing new engineering designs.

The other UNSW grant recipient was A/Prof. Sidney Newton from the Faculty of the Built Environment. His team received $217 000 in funding to refine a "hyper-immersive virtual reality simulator" for construction management and architecture students.

Significant Paper

Em/Prof. Lawry Doctors has been advised by the Society of Naval Architects and Marine Engineers that his paper, *Near Field Hydrodynamics of a Surface-Effect Ship*, originally published in the September 2012 issue of the *Journal of Ship Research*, has been selected by the SNAME Featured Papers Committee as a Significant Paper of 2012. Significant Papers are chosen from among all papers presented at SNAME symposia and published in SNAME periodicals throughout the year, and will be re-published in the 2012 volume of the SNAME Transactions. Congratulations, Lawry!

Construction Progress

In preparation for the construction work on the Mechanical and Manufacturing Engineering tutorial and laboratory buildings, relocations (decantings) of students and staff are under way. Patterson Building Group has been appointed to carry out construction activities in the Blockhouse, Tyree and Willis Annexe in preparation for the Stage 1 Decant. Works in the Blockhouse and Tyree were completed in early July, allowing elements of Precision, Mechatronics, Metrology, Waterjet and Applied Mechanics to be relocated to their temporary accommodation. The Fluid Dynamics Lab has recently moved on Level 2 of the Willis Annexe. The Aerodynamics Lab has also undergone some recent changes, and Terry Flynn and Movelink have reviewed all equipment and operations in the lab and prepared for the construction activities which commenced in July. John Page and John Olsen moved into Level 1 of the Library (off the Commerce Courtyard, where Nura Gili used to be), along with the Swarm and Flight Simulator. Bruce Oliver and the Undergraduate Teaching Lab (UTL) have been operating in Building G23 (formerly the SIRF building) since early June and the UTL became fully operational for the start of Semester 2 in late July. The UNSW Solar Car Team has also moved into G23 working on "eVe", their new car for the World Solar Challenge.

UNSW Joins Globaltech

The University of New South Wales has been recognised as one of the world's top science and technology universities with an invitation to join Globaltech, the Global Alliance of Technological Universities. UNSW is the first new member admitted to the exclusive network since its inception in 2009. The seven founding universities are Caltech (California Institute of Technology, Pasadena), Imperial College (London), ETH (Eidgenossische Technische Hochschule, Zürich), Georgia Institute of Technology (Atlanta), Indian Institute of Technology (Bombay), Nanyang Technological University (Singapore), and Jiao Tong University (Shanghai). Further information is available on the UNSW News Website at

https://newsroom.unsw.edu.au/news/general/unsw-joins-worlds-best.

Phil Helmore

Alexei Krylov
On the 150th Anniversary of his Birth

Yuriy Drobyshevski

A real engineer must believe his eye more than any formula

A.N. Krylov

The Russian engineer and scientist Alexei Nikolaevich Krylov is known for his work in naval architecture, mechanics and mathematics. To naval architects and ocean engineers his name is familiar from the concept of Froude – Krylov wave forces in ship dynamics. Although he worked in Russia most of the time, his impact was international as Krylov made outstanding contributions to various branches of engineering and science.

Alexei Krylov

Krylov was born on 15 August 1863 in the village of Visyaga in the Simbirsk region some 650 km east of Moscow. His father was a retired artillery officer who took part in naval operations in the Black Sea. Among his relatives and friends were the families of Lyapunov, Chebyshev and Filatov, who were well-known scientists and this atmosphere influenced Alexei's future interests. In 1884 he graduated from a four-year course at the Naval College in St Petersburg to become a naval officer. While at the College he took interest in mathematical subjects and read original works of prominent mathematicians and astronomers. His analytical interests were noticed by his teachers and Krylov stayed at the College to work on magnetic compasses, the area which became his life-long passion and which was the topic of his first publications.

After an engineering practice at a St Petersburg naval shipyard, in 1888 Krylov entered the Naval Architecture department of the Naval Academy. He completed the course in 1890 and commenced teaching at the Academy, while also undertaking a variety of work for the Navy. His first article on a naval architecture subject appeared in 1888, in which he presented a method for the structural analysis of a gun turret for a battleship. In 1895 he made a presentation to the Russian Technical Society on the method for predicting the pitching motion of a ship, the problem which was brought to him by the Naval Ministry in relation to the planning of a new port.

In 1896 Krylov became an associate member of the Institution of Naval Architects (INA) in London and presented his first paper on the theory of ship motions [1]. It is this paper and the two follow-on papers presented by Krylov in the following year [2], [3] that introduced new methods in the analysis of ship motions.

Based on the assumption of negligible wave diffraction due to the presence of a ship, Krylov showed a practical method for calculating the wave-exciting forces and developed the equations of ship motions which remained virtually unaltered to this day:

$$\frac{P}{g}\frac{d^2\zeta}{dt^2} + 2\,N\frac{d\zeta}{dt} + q\,S_0\,\zeta = q\,r\,a'_0\cos\frac{2\,\pi\,t}{\tau} + q\,r\,b'_0\sin\frac{2\,\pi\,t}{\tau}$$

$$K\frac{d^2\theta}{dt^2} + 2\,N_1\frac{d\theta}{dt} + P\,(R - a)\,\theta = q\,r\,a'_1\cos\frac{2\,\pi\,t}{\tau} + q\,r\,b'_1\sin\frac{2\,\pi\,t}{\tau}$$

Figure 1: Equations of heave and pitch motions: extract from [1]

Krylov also considered the effect of non-cylindrical hull shape and the sensitivity of motions to damping. In his papers, Krylov presented a complete worked example by calculating the motions of a cruiser, depicting ship motions relative to the waves and calculating the wave-induced bending moment. This latter issue sparked a lively discussion at the INA meeting and Krylov explained the concept by using "stick and fingers".

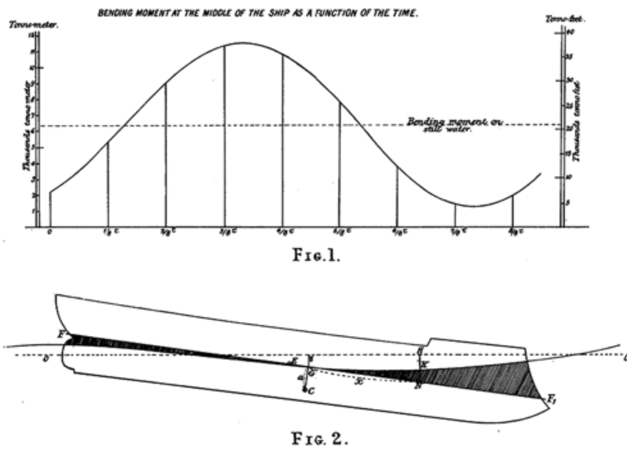


Figure 2: Diagram for wave bending moment: extract from [1]

Given the status of this subject at the time, Krylov's papers were a landmark development which was well received by the Institution. When closing the discussion of Krylov's paper the INA Vice-President, Sir Edward Reed, said [1]:

"My Lord, I should just like to say how much we are indebted to Captain Kriloff for this paper. I am sure everyone who has been connected with this institution, from the first, will feel that he has made to it a most valuable contribution in that branch of science which is most difficult to pursue with success… Therefore, I only rise as an old member of the Institution to express our grateful thanks to Captain Kriloff, and our admiration of his work"

In 1899, Krylov was awarded a Gold Medal by the INA for his papers on ship motions. In 1897, he became a member of the French Maritime Society and his papers were re-published in French. Krylov's continued work on ship motions would later be consolidated in a book.

However, his interests were not limited to ship dynamics and covered a wide range of issues related to maritime engineering. In 1900 Krylov was appointed Manager of the St Petersburg towing tank, while retaining his lecturing position at the academy. He upgraded the towing tank (which would become the Research Shipbuilding Institute carrying his name many years later), undertook rigorous verification of the Froude method for calculation of ship resistance, and ran a number of model tests on ship resistance and damage stability.

In 1901 he proposed the damage stability tables which would enable the crew to quickly assess the damage stability of a ship in a battle and to develop counter-flooding measures. At that time he formulated his key principle for hull subdivision, which is probably relevant to this day: "A [damaged] ship must sink without capsizing" [4]. This means that provisions must be incorporated in the design to ensure that, in the event of any damage, the ship's stability will not be lost before its buoyancy. Unfortunately, Krylov's proposals were not favoured by the officials in spite of debate spilling into the press. It was not until after the defeat at Tsushima in 1905, which saw many Russian battleships capsize, that the "Krylov's tables" were appreciated.

At the Naval Academy, Krylov revised courses on ship theory, mechanics and mathematics. He was probably the first in the Russian engineering practice to demonstrate how many significant digits should be kept in the result based on the accuracy of the input data and the practical need. Given the time spent on hand calculations at that time, commercial advantages were obvious. Later in his career Krylov is known to have enforced these requirements strictly, including a case when a disobedient engineer lost his job on the spot for performing calculations with too many significant digits.

Krylov was also involved in new designs, full-scale trials and proposed a number of technical inventions, including inclinometers, optical sights, and devices to measure ship motions and stresses. In 1902 he took part in a voyage of the first Russian ice-breaker *Yermak* and recorded ship behavior and ice loads. Krylov also undertook testing and analysis of novel submarines, performed the first full-scale measurements of vibration on naval ships, developed a complete theory of gyroscopic roll stabilisation and put forward proposals for its use.

During those years Krylov published several papers. In 1906, at the request of mathematician Klein [6], Krylov wrote an article on ship theory for the German *Encyclopedia of Mathematics*, which included a summary of his work on ship motions. Krylov also delivered a series of open lectures, which had a profound influence on engineers at the time. Stephen Timoshenko, who would later become a renowned authority in applied mechanics and professor at several universities in the USA, acknowledges in his memoirs [7] that it was attending Krylov's lectures which made him realise what should be the way for approaching engineering problems.

In 1905 Krylov became a member of the Maritime Technical Committee within the Russian Naval Ministry and, soon after, he was appointed as head of this Committee (1907) and acting Chief Inspector for Naval Shipbuilding (1908). In these positions Krylov assumed responsibility for technical developments within the Navy including the new shipbuilding program in the pre-World War I years. As Russia was entering the Dreadnought race, Krylov led the design and tendering process and oversaw the building of the first Russian battleships of the Gangut class (also known as the Sevastopol class). These 181 m long ships of 23 370 t displacement were armed with 12 x 305 mm main guns in four linearly-arranged turrets [8]; they became the most advanced ships built in Russia by that time.

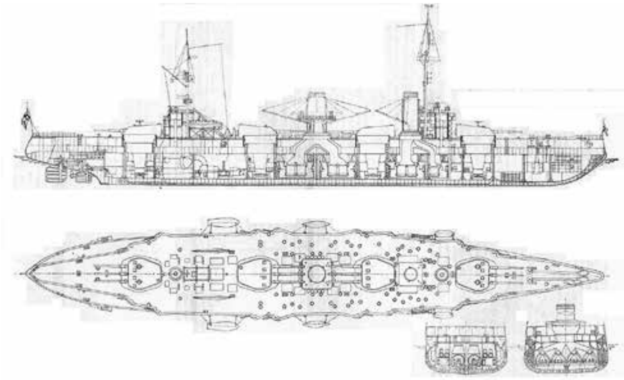


Figure 3: The Gangut-class battleship [8]

The design involved a number of challenges and Krylov encouraged the use of new practices and attracted the best engineers. One of them, Timoshenko, reflected on this time in his book [6]:

"Many new problems appeared in the design of these new ships and Krylov had ample scope to use scientific methods as far as possible for solving them. His idea of replacing rules-of-thumb by mathematical analysis proved very successful and, under Krylov's leadership, many structural problems were satisfactorily solved"

Four such ships were built for the Baltic Fleet and several more for the Black Sea Fleet. Some of the Gangut-class battleships saw action in both World Wars and two of them remained in service until 1956.

His dislike for red tape did not help his career and, in 1910, Krylov resigned from his office positions and re-joined the Naval Academy as a Professor. However he remained a member of the Maritime Technical Committee and stayed closely involved with the Navy. His advisory role extended to writing Ministerial speeches asking for funding from the Parliament to support the shipbuilding program. In 1913 he arranged full-scale trials of roll-stabilisation tanks. In 1916 he led an investigation into the explosion and capsizing of the battleship *Empress Maria* in Sevastopol, for which he investigated stability in the inverted mode and developed a salvage proposal.

While teaching at the Naval Academy, Krylov published several books. His two books on numerical methods and on differential equations in engineering printed in 500 copies were sold out in a few days and saw several editions (the latter book was also published in French in 1927). In 1914 he became an associate and, in 1916, a full member of the Russian Academy of Science. He was the first Russian engineer to become an academician.

After the 1917 revolution Krylov, who was in the rank of General at the time, remained in Russia. The new government appointed him the director of the Naval Academy. His two sons joined anti-Bolshevik forces and were killed in the civil war; his wife and daughter migrated to France [9]. In 1921 Krylov was sent on an overseas trip which lasted till 1927. During these years he represented the Russian Academy of Science for re-establishing contacts with the West and purchasing new equipment. He was also in charge of the sea transportation of 900 steam locomotives purchased by the new Russian government. This vast project involved a number of challenges and required Krylov to travel all over Europe, develop ship specifications, conversion and sea-fastening plans and supervise loading, sometimes using a hammer himself.

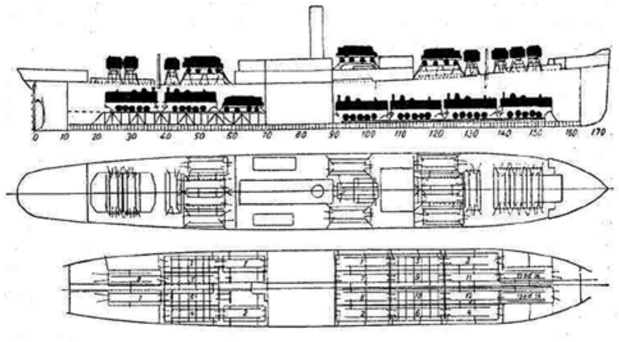


Figure 4: Arrangement of steam locomotives on a 385 ft (117 m) cargo ship: extract from [4]

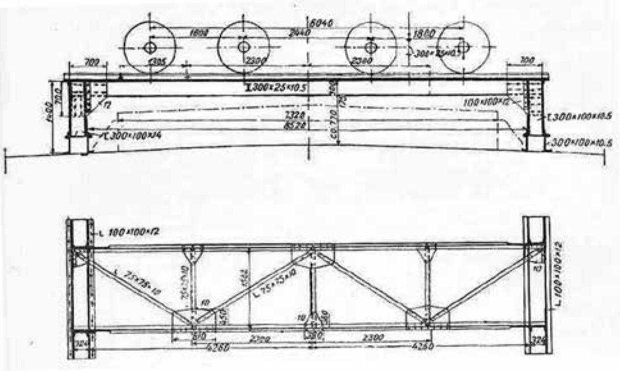


Figure 5: Trusses and sea-fastening of locomotives above hatches: extract from [4]

Upon his return to Russia in 1927, Krylov resumed his Professorship role at the Naval Academy. His consulting work spanned all areas of shipbuilding: design of new ships, setting up new shipyards, work of the Russian Maritime Register, and shipping in the Northern Arctic Route. He initiated a popular Technical Society for Shipbuilding, organised its conferences and was its chairman. He published a number of papers and books on ship theory, ship vibration, ship accidents, beams on elastic foundation, compasses, ballistics (which was another area of keen interest) and history of science.

At the Academy of Science, Krylov took part in numerous symposia and was a member of scientific councils at several universities. From 1928 he was also the director of the Institute for Applied Mathematics in Moscow. He made fundamental contributions to mathematics, including the area which is now known as "Krylov methods" and which sprawled from his 1931 paper on the natural frequencies of mechanical vibrations.

Krylov undertook the enormous task of translating Newton's *Philosophia Naturalis Principia Mathematica* into Russian. His translation, which came out in 1915, had more than 200 footnotes and explanations that Krylov added to facilitate understanding of this classic text. The second edition was published in 1936 and the latest edition came out in 2008. Krylov also translated Euler's book on the theory of the moon and several works of Gauss into Russian.

During the Second World War, Krylov was evacuated to the city of Kazan where he continued working with the Academy of Science and consulting at a design office. In 1942 he was elected a Fellow of the RINA, and he was deeply proud of this title. At that time he also completed his memoirs [4], the book which was re-printed and sold out several times. Krylov's work was acknowledged by the highest USSR awards. His last publications appeared in 1945 and he passed away on 26 October that year in Leningrad (St Petersburg). In 1956 the Academy of Science completed publication of his consolidated works in 12 volumes, which reflected only a part of his legacy as a "great engineer and scientist" [6].

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ShipConstructor Software Inc. renamed SSI

ShipConstructor Software Inc. has changed its name to "SSI". The name of the company's flagship CAD/CAM software suite will remain as ShipConstructor.

Separating the company name from the product name will allow SSI to bring greater focus to its full range of products and services such as complimentary Autodesk software, as well as SSI training and consulting. This also sets the stage for the company to expand into other products currently under development.

"Our company is growing," explained SSI CEO Darren Larkins. "Increasingly, we see ourselves acting as an expert advisor to help implement a total enterprise-wide solution, maximizing overall productivity. This is the essence of our tagline 'Empowered Engineering'."

To reflect this name change, SSI has a completely new website with dramatically upgraded content, imagery and videos highlighting the company's products and services along with an explanation of its vision. The old website address www.shipconstructor.com will now be redirected to the new address www.SSI-corporate.com.

ShipConstructor 2014 Released

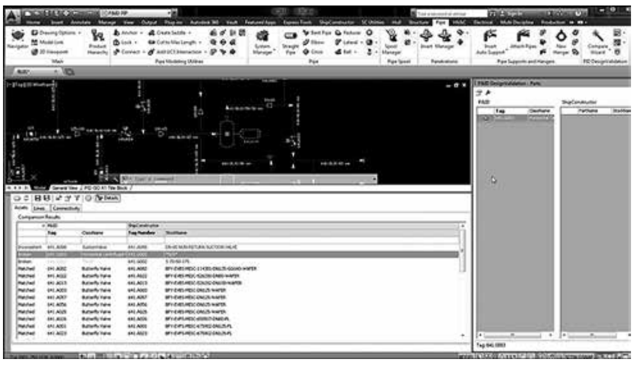
SSI has released its most significant software upgrade to date — ShipConstructor 2014.

Overview

SSI has dramatically enhanced ShipConstructor's user experience to promote more-efficient workflow. Major new products have been added to the software suite, containing improved capabilities for the design and construction of piping systems along with enhanced capabilities for the reuse of design work. Most noteworthy of all is an innovative new product called MarineDrafting which allows 2D approval and workshop drawings (in DWG format) to be created directly from the 3D model while remaining associatively linked. These new products, along with numerous enhancements, give users the ability to increase productivity and add new deliverables to their current service offering.

P&ID DesignValidation

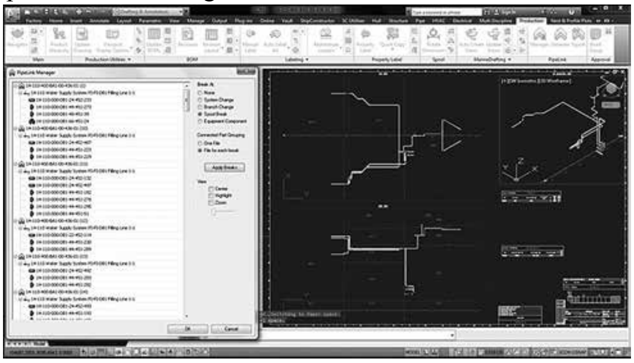
A new product, P&ID DesignValidation allows for the checking and validation of the ShipConstructor 3D pipe model against 2D schematics generated in standalone P&ID software including AutoCAD P&ID. The validation is performed using neutral formats in order to allow clients more flexibility in the choice of P&ID software.



The P&ID DesignValidation screen
(Image courtesy SSI)

PipeLink

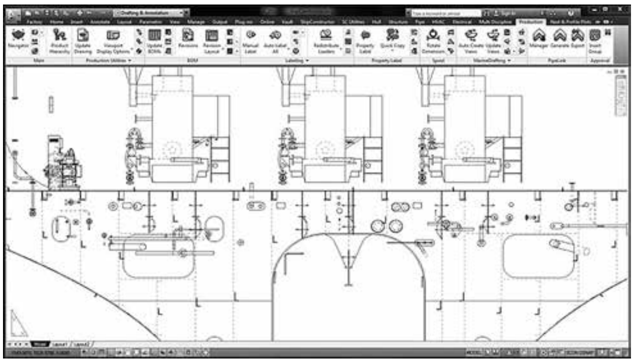
PipeLink allows the piping systems within a ShipConstructor project to be used within other business processes and applications. This is accomplished through an export to the PCF format from within a ShipConstructor production drawing.



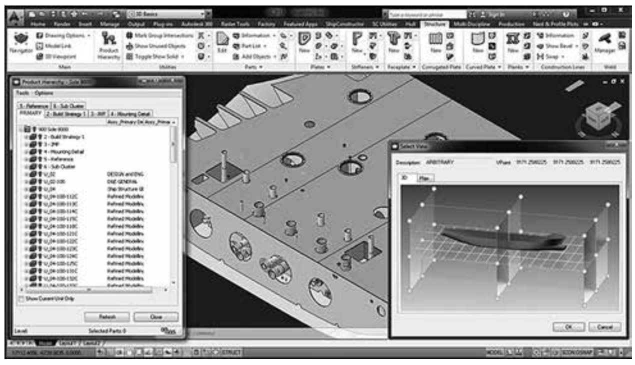
The PipeLink screen
(Image courtesy SSI)

MarineDrafting

In a world of 3D design and manufacturing, many activities still need to be supported with 2D drawings during design and throughout the shipyard. Using shipyard standards, MarineDrafting allows the creation of 2D approval and workshop drawings directly from the 3D model. These drawings are created in AutoCAD DWG format and remain associatively linked to the 3D model as changes happen.



MarineDrafting
(Image courtesy SSI)



ShipConstructor 2014 promises a completely new user experience
(Image courtesy SSI)

Completely Redesigned User Experience

ShipConstructor 2014 brings a modernised user experience to ShipConstructor which improves the discovery of features and intuitively guides users in accomplishing tasks. It has over 400 redesigned icons and new arrangements of tools and commands in ribbons and windows. These changes enhance clarity and more accurately reflect modern workflows. ShipConstructor 2014's new environment loader is a notable example of this enhancement.

Improved Labelling

Based upon analysis of how clients perform labelling, SSI has made changes to improve efficiency. This enhancement will further add to ShipConstructor's competitive advantage related to its strength in efficient detailing of drawings.

WorkShare Enhancements

Finally, ShipConstructor's ability to share work between distributed offices has further improved. WorkShare Project has several new features to improve efficiency, such as the ability to save selection sets in the "Split" dialog, as well as command-line options for automation.

New Web Site for HydroComp

HydroComp, Inc., an innovator in resistance and propulsion software and services, has announced the launch of its newly-designed website — www.hydrocompinc.com. The website update was part of an extensive repositioning strategy aimed at expanding its role as a global leader in marine performance and propeller design software and consulting.

Designed to be fast, simple, and user-friendly, the new HydroComp website showcases a more modern look and feel. The website has a more-vibrant color scheme, improved page layout and increased functionality. A better overview of consulting services, particularly highlighting the work in AUV/ROVs has been added, as well as additional case studies. Another notable change is the reorganisation of the knowledge-base section. This knowledge-base area offers a more-robust and in-depth number of technical articles and white papers.

The latest news, press, trade show and training events are more prominently displayed on the main page.

"Innovation is what will continue to make us successful and enable us to provide the ground breaking hydrodynamic software and services that our customers come to rely on", according to Managing Director, Jill Aaron. The new website demonstrates that commitment.

Celebrating its 29th year of operation in 2013, HydroComp provides software and services for the performance analysis and design of marine vehicles to industry, research, government, and academic clients. HydroComp is the developer of the award winning NavCad, PropElements, PropExpert, PropCad and SwiftCraft software packages used by more than 700 marine professionals worldwide.

Wärtsilä AQUARIUS EC Ballast Water Management System receives Final Approval Status

Wärtsilä has received the final approval status from the International Maritime Organisation's (IMO) Marine Environment Protection Committee (MEPC) for its Wärtsilä

The Wärtsilä AQUARIUS® EC Ballast Water Management System
(Photo courtesy Wärtsilä)

AQUARIUS® EC Ballast Water Management System. The approval was granted at the MEPC's 65th session held at the IMO headquarters in London on 13 May 2013. The Basic Approval had been granted in October 2012.

The approval submission was taken into consideration as part of the MEPC 65's agenda covering "harmful aquatic organisms in ballast water". Final approval is required for systems using an active substance, and is based upon examination of full-scale prototype test data and all required supporting documentation on aspects such as risk and safety to the ship, crew, general public, and the environment.

The documented information was reviewed and approved by a joint panel of experts from the Scientific Aspects of Marine Environment Protection ballast water working group. The application was submitted to the IMO by the Dutch Human Environment and Transport Inspectorate. A key element of the final approval submission was an investigation covering the impact of treated ballast water on coated and uncoated materials. A full Type Approval certificate for the Wärtsilä AQUARIUS® EC system was expected by the end of July this year.

The Wärtsilä AQUARIUS® EC System

Wärtsilä AQUARIUS® EC is a modular ballast water management system, providing a safe, flexible and economical process for the treatment of ballast water.

Ballast water treatment with an Wärtsilä AQUARIUS® EC system is achieved through a simple and efficient two-stage process. Upon uptake, the sea water is first passed through a back-washing filter (1st Stage) and then the filtered sea water passes through a static mixer, where the disinfectant generated from the side-stream electrolysis unit (2nd stage) is injected to ensure that a maximum level of 10 parts per million (ppm) remain in the treated ballast water.

During discharge, the filter is bypassed and any residual oxidant in treated ballast water is monitored before being discharged overboard. If required, treated ballast water is neutralised by injecting sodium bisulfite into the main ballast line during discharge. Neutralisation effectiveness is continuously monitored to ensure compliance with MARPOL discharge limits.

Francisco Powered by Wärtsilä Axial Waterjets

Wärtsilä has provided the waterjets for what is claimed to be the world's fastest high-speed ferry. In addition to two of its LJX1720SR axial waterjets, Wärtsilä has also supplied an advanced propulsion-control system for *Francisco*. The 99 m catamaran attained a lightship speed of 58.1 knots in her recent speed trials. The ship was built by Incat Tasmania for the South American operator Buquebus to transport passengers and cars between Uruguay and Argentina.

The Wärtsilä equipment was supplied at the end of 2012, and commissioning of the vessel took place in early 2013. A feature of the Wärtsilä waterjets is the high level of efficiency, which allows impressive power to be applied on relatively small jets. Furthermore, the compact dimensions enabled the waterjets to be installed within the ferry's transom, thus saving valuable space.

Wärtsilä's Lipstronic 7000 propulsion-control system for manoeuvring the vessel gives effective, reliable control of all the waterjets and is very easy to use. It is designed in accordance with IMO regulations and fulfils the requirements of all leading classification societies. The system controls and indicates the steering angle, bucket position and impeller speed, and can be operated alternatively with joystick control or autopilot. The system's built-in redundancy makes it safe and robust.

According to Incat, *Francisco* is now the fastest ship in the world. The ferry will have an operating speed of 50 kn and, in crossing the River Plate (Rio de la Plata) at high speed, the ferry will be able to viably compete with air traffic between Buenos Aires, Argentina, and Montevideo, Uruguay.

"*Francisco* will be the largest catamaran to be operated by Buquebus, and the fastest, environmentally cleanest, and most-efficient high-speed ferry in the world," said Juan Carlos Lopez Mena, President of Buquebus.

A Wärtsilä waterjet at work in *Francisco*
(Photo courteay Wärtsilä)

Tonnage Measurement

Lindsay Emmett

Sooner or later a young naval architect will encounter the term 'tonnage measurement', i.e., the determination of a vessels gross and net tonnage or, as our American colleagues tend to refer to it; 'tonnage admeasurement'. The evolution of methods to determine a ship's tonnage, as we know it today, is an interesting story.

To some, tonnage measurement appears to provide meaningless numbers which give an indication of a vessel's size and carrying capacity. Also, these tonnage values may need to appear on a vessel's statutory certification. From the outset, a naval architect should be aware that tonnage measurement has nothing to do with assessing the seaworthiness or safety of a vessel.

Two types of tonnage have evolved over the years, namely gross tonnage (GT) and net tonnage (NT). Gross tonnage is intended to express a vessel's internal capacity (or a vessel's size), whilst the net tonnage is intended to express a vessel's revenue-earning capacity.

However, authorities today do use a vessel's gross tonnage in some circumstances for the application of various rules and regulations. Some requirements, such as those found in SOLAS, are tonnage based, e.g. SOLAS uses the value of 500 gross tons as the benchmark for the application of the Convention to cargo ships. Where the requirements found in the International Convention on Load Lines, and the Uniform Shipping Laws (USL) Code, for example, are primarily length based, a vessel's manning requirements may also be based on tonnage.

Depending on a vessel's trade, gross and net tonnage values could have a direct bearing on the vessel's design. So what is the primary significance of tonnage measurement? From the earliest days of sea trade, there was a need to define, measure and record a vessel's cargo-carrying or earning capacity. It was only natural that interested parties would need to know the quantity of goods that a vessel was capable of carrying. This necessity was further intensified by the need to obtain a basis for the levying of taxes on cargoes carried, and later for the fixing of payments to port authorities, or private persons, for the services rendered to a vessel; i.e. for levying on dockings, harbour dues, lockage, wharf and canal dues, etc.

At first, to determine the amount of cargo which a vessel could carry, the unit of measure as to a vessel's size depended on the nature of the cargo. In the course of time, various measures were introduced in different European regions in accordance with the most-important commodity exported from the country concerned.

In the Baltic ports, and in ports in the northern part of the European continent, the export of grain predominated and the unit used for measurement was the so-called *last*, a unit of measure of about 4000 lb (1814 kg). During the 13th century wine was shipped from France to Britain in wooden barrels called *tonneaux*. Duties were levied in Britain on vessels by the number of wooden wine barrels, generally referred to as the *tonnage* in order to collect taxes for the Crown. The unit of measure was gradually standardised by an enactment prohibiting the carriage of wine in barrels or *tuns* of less than 252 gallons (1146 L), equivalent to about 2240 lb (1016 kg) and in volume to 40.3 ft^3 (1.14 m^3). This standard barrel size went on to become the unit of measurement of a vessel's internal volume.

During the 15th century, vessels began being assessed in accordance with the weight of the cargo carried. From Newcastle (UK), considerable amounts of coal were carried in small coastal vessels known as *keels*. In order to prevent tax evasion, a *keel* was not permitted to have a capacity more than 20 *chaldrons* of 126 ft^3 (3.57 m^3) each.

It is interesting to note that, in the reign of King Henry V, it was decreed that these small coasters (*keels*) engaged in the Newcastle coal trade should be measured and marked. This appears to be a first step in the introduction of load line legislation and recognition of the importance of freeboard. These small coasters in time became subject to a weight limit of 26½ tons (26.9 t), and nails hammered into the stem, stern and amidships hull planking marked a maximum load line. This system eventually extended to all ships and the standard of measurement became 2240 lb, or one *ton*.

Additionally, the salt trade along part of the French coast gave rise to the use of the *brouage* as a unit of measure. One hundred *brouages* were sometimes called a *zent*.

Given the various methods used in the early days to assess the carrying capacity of a vessel, it has to be remembered that the wooden cargo vessels of that era were relatively small. However, the author has no knowledge of how the authorities of the day assessed the levies for a vessel carrying a mixed cargo, or one not fully loaded.

However, the attempts in Europe were not the earliest to measure a vessel's size. Chinese records indicate that, long before the Christian era, a system of tonnage assessment was in operation in that country to indicate the size of a ship. Also, in the flourishing days of the Indian merchant marine, they measured the capacity of their wooden vessels with the aid of bags of pepper.

During the 16th and 17th centuries, attempts were made to attain a higher degree of uniformity in the determination of tonnages for ships carrying various cargoes. Sir William Monsom, in 1642, was the first to publish a rule for determining tonnage by dividing the product of the length of the keel, the breadth and the depth by 100. The result was possibly meant to be an approximation of a vessel's deadweight. This approximation, made by means of such a simple rule, was due to the slight differences in the shape of the submerged parts of ships of that era.

By 1678 Thames shipbuilders expressed the deadweight of cargo their ships could carry in terms of their principal dimensions. This method of measurement had some basis in logic and resulted in what is known as the *Builders Old Measurement Rule*, i.e.

$$\textit{Deadweight (DWT)} = 0.62 \times \frac{L \times B \times B/2}{35} \times 3/5 = \frac{L \times B \times B/2}{94}$$

A block coefficient of 0.62 was considered a fair average at the time, and 3/5 of the displacement was assumed as the ratio of the deadweight to the vessel's displacement. The term B/2 (breadth/2) was taken to generally equate to the vessel's depth. This was done primarily so that authorities could calculate the tonnage of a floating vessel.

Astute naval architects of the day were quick to realise that if they reduced the breadth, increased the depth and made the vessels of full form, they could achieve an actual ship's deadweight that would be greater than the deadweight predicted by the *Builders Old Measurement Rule,* and hence pay less dues and taxes. Unfortunately, vessels with a narrow beam, a high centre of gravity, and propelled by wind can have problems from a stability aspect. It wasn't until 1746 that the French mathematician, Pierre Bouguer, came along to explain in mathematical terms the principles of a ship's stability, i.e., the function of the metacentre, along with the basics that underpin the inclining experiment, that naval architects became fully aware of the dangers of designing a ship with the *Builders Old Measurement Rule* in mind.

Many attempts were made to develop an acceptable and more correct method of measurement. Joannes Huddle of Amsterdam in the late 17th century proposed that the light and load draughts of every ship be determined. The area of the load line midway between these extremes is then determined by means of the trapezoidal rule. This area multiplied by the distance between the two extreme load lines was to indicate the deadweight.

The *Builders Old Measurement Rule* became the basis of British tonnage regulations until 1835. A Royal Commission finally concluded at that time that the weight of cargo a ship was capable of carrying was exceeding the legal limit, on average by 33 percent. As such, the Commission concluded that the *Builders Old Measurement Rule* was not a true indication of the carrying capacity of a ship. As a result, tonnage measurement became a measure of the vessel's internal capacity. For ease of measurement, only three transverse sections were prescribed along the length of the ship. Once again, this led creative naval architects to come up with anomalies in design.

In 1849 a new Royal Commission further studied the tonnage measurement problem and their recommendations evolved into the system of tonnage measurement used by all the principal countries of the world, along with the two principal canal authorities today. The Secretary of the Commission was the then Surveyor General for Tonnage, George Moorsom. The tonnage system enacted then has come to be known as the 'Moorsom System'.

The basic idea behind the system was that the assessment of dues for services should be based on a vessel's potential earning capacity. It was concluded that the spaces available for the carriage of cargo and passengers would be a measure of that earning capacity. Moorsom's system called for the determination of two tonnages. The first was to include the gross or entire space except 'exempted' spaces. The second was to be that remaining after certain 'deductions' had been made. The two tonnages became known as the gross and net tonnage.

Life was easy when dealing with sailing ships which generally had a cargo-carrying space extending from the forepeak to the aft peak bulkhead. With advent of the steamship, exempted and deducted spaces took on a whole new meaning. In time, deductions not only included the machinery, boiler and coal-bunker spaces, but went on to include navigation, crew and water-ballast spaces.

After the passing of the British Merchant Shipping Act of 1854, other countries gradually followed suit and adopted the Moorsom system. However, due to the varying interpretations made by individual countries, considerable differences arose in the application of the system, and early disputes arose over the application of exemptions and deductions.

One of the problems revolved around the assertion that only 'closed in' spaces were available for cargo, and hence only be included in the gross tonnage. The rules were gradually amended to define minimum-sized openings that would allow a space to still be considered 'closed in'. These openings were permitted to have temporary closures to provide a degree of protection, without being watertight. This lead to what were termed *tonnage openings* which permitted a space to be considered open and not closed in. Cargo vessels which incorporated this feature were generally referred too as *open shelter-deckers*. These tonnage openings generally took the form of openings in the shell or bulkhead plating above the shelter deck and small hatches on the weather deck which were about two frame spaces long and the width of a normal hatch.

This situation lasted until 1965 when the Tonnage Mark Scheme permitted the exemption of shelter-deck spaces to be based on a reduction in draught, instead of fitting openings.

During the mid-nineteenth century, the Moorsom system worked relatively well for the simple vessels of that era. With the advent of more-sophisticated designs and propulsion systems, the resultant tonnages derived did not give a true representation of a vessel's size or carrying capacity.

By the early 1900s, most marine nations had adopted the British system of tonnage measurement. Unfortunately, as mentioned, individual interpretations of the rules by various nations meant that the tonnage of sister ships flying different flags could be vastly different. These discrepancies generally indicated a decrease of tonnage and were welcomed, not only by the owners, but also by their authorities and were even encouraged in some countries on account of the profits yielded by vessels carrying their flag. This had another side effect in that some port authorities would not recognise certificates of tonnage issued by these countries.

Various attempts under the League of Nations were made from 1925 to provide uniform interpretations at an international level. Additionally, conferences hosted by Oslo in 1938 and 1947 reviewed the work of the League of Nations and proposed further revision to the aim of adoption. The latter Oslo conference produced a convention which came into force in December 1954. Although the Oslo convention tried to eradicate the variety of interpretations used in the measurement of tonnage, it did not have universal approval.

In 1948 the United Nations established the Inter-Governmental Maritime Consultative Organisation (IMCO — now the IMO) and came into existence in 1958. Right from the start, tonnage measurement was a preoccupation. Finally an IMCO Technical Committee made recommendations that resulted in the International Tonnage Convention (1969) in use today. The new Convention was broadly based on the 1966 International Load Line Convention in that it consists of Articles which provide obligations between

Governments, along with matters of a general nature. The Convention also has two Annexes; Annex I comprises the Technical Regulations, and Annex II contains the format of the International Tonnage Certificate (1969).

For a naval architect working in industry, a tonnage measurement should hold no fears, unless a specification requires a vessel to be below a certain tonnage so as to take the best advantage of the rules and regulation of the day. As the signatory to the International Tonnage Convention (1969), only a vessel's flag State (in Australia's case, AMSA or their delegate) has the authority to carry out the relevant calculations. As tonnage measurement is a volume-based calculation, the authority will undertake the calculation during the final stages of a vessel's build phase to ensure that any late design changes are taken into account.

The International Tonnage Convention (1969) has now been in existence for over 40 years, without a major review or amendment. To some it's not unreasonable, given the advances in ship design, and the marine industry, that a major review of the Convention may be warranted.

However, if a naval architect suspects at the preliminary design stage that a vessel's tonnage may come close to a benchmark for the application of the various regulations, the naval architect should approach the vessel's Flag State authority for guidance.

On completion of the tonnage calculation, the vessel's Flag State will issue the owner an International Tonnage Certificate indicating the vessel's gross and net tonnages. In the case of a vessel assigned multiple load lines, usually tankers, an International Tonnage Certificate relevant to each load line will be issued. Additionally, if queried, the vessel's Flag State will resolve any disputes arising from the gross and net tonnage values indicated on the certificates.

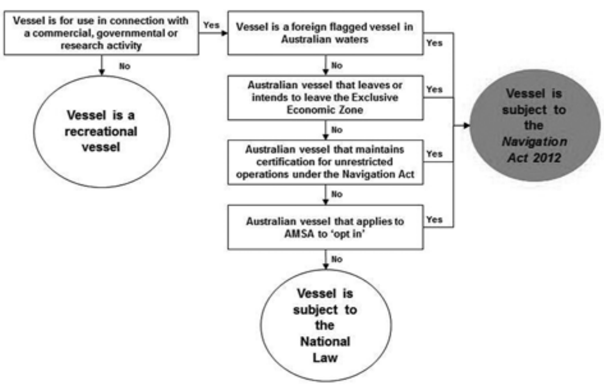
A tonnage certificate is not automatically cancelled when a vessel changes registry. A Flag State has to submit the tonnage calculations to a foreign administration in the event that a vessel changes registry in order that the incoming administration can assess whether the tonnage calculations are true an accurate.

Apart from International Tonnage Convention (1969), there are other specialised tonnage measurements, namely the Suez Canal, Panama Canal, and European Canal tonnages. For the assignment of specialised tonnage values, a naval architect would need to apply to the maritime authority of the vessel's Flag State.

THE PROFESSION

Entry into force of the Australian Navigation Act 2012

The Australian Navigation Act 2012 entered into force on 1 July 2013. The flowchart below shows details of those vessels which will (or will not) be subject to the new Act.



Vessels subject to the Navigation Act 2012
(Image from LR *Classification News,* No. 13/2013)

One important change to the current arrangements is that all foreign-flagged vessels operating in Australian waters are now subject to the Navigation Act. This means that they are also subject to port state control, which was not previously the case for those vessels under state or territory jurisdiction. The Australian Maritime Safety Authority (AMSA) has issued Marine Notice 08/2013 (downloadable from https://dl.dropboxusercontent.com/u/12013214/AMSA%20MN%2008-13.pdf) which provides further details.

LR *Classification News,* No. 13/2013

Revision of NSCV and NSAMS

AMSA is reviewing and rewriting the National Standards for Commercial Vessels (NSCV) and the National Standard for the Administration of Marine Safety (NSAMS). This is a major task, expected to be completed within three years. There will be many opportunities for interested parties to contribute to the process. To get the conversation started and to ensure that all issues which need to be addressed are identified, AMSA is inviting early comment on the standards listed below. There will be many other opportunities to become involved, including as reference group members and during further public and inter-agency comment periods. Please do not hesitate to get in touch if you would like to know more.

Consultation	Closing Date
NSCV Part B (Discussion Paper)	5:00 pm EST, 23 August 2013
NSCV Part C3 (Discussion Paper)	5:00 pm EST, 23 August 2013
NSCV Part C4 (Discussion Paper)	5:00 pm EST, 23 August 2013
NSCV Part C5A (Discussion Paper)	5:00 pm EST, 23 August 2013
NSCV Part C5B (Discussion Paper)	5:00 pm EST, 30 November 2013
NSCV Part C5C (Discussion Paper)	5:00 pm EST, 30 November 2013
NSCV Part C5D (Discussion Paper)	5:00 pm EST, 30 November 2013
NSCV Part C6A (Discussion Paper)	5:00 pm EST, 23 August 2013
NSCV Part C6B (Discussion Paper)	5:00 pm EST, 30 November 2013
NSCV Part C6C (Discussion Paper)	5:00 pm EST, 30 November 2013
NSCV Part C7A (Discussion Paper)	5:00 pm EST, 30 November 2013
NSCV Part C7B (Discussion Paper)	5:00 pm EST, 30 November 2013
NSCV Part C7C (Discussion Paper)	5:00 pm EST, 30 November 2013
NSCV Part C7D (Discussion Paper)	5:00 pm EST, 23 August 2013
NSCV Part F1A (Discussion Paper)	5:00 pm EST, 30 November 2013
NSCV Part F1B (Discussion Paper)	5:00 pm EST, 30 November 2013
NSCV Part F1C (Discussion Paper)	5:00 pm EST, 30 November 2013
NSCV Part F2 (Discussion Paper)	5:00 pm EST, 02 August 2013
NSCV Part G (Discussion Paper)	5:00 pm EST, 23 August 2013
NSAMS 4 (Discussion Paper)	5:00 pm EST, 02 August 2013

For any general enquiries or comments, please email national.system@amsa.gov.au.

To make a formal submission, download the relevant public comment form available from http://nationalsystem.amsa.gov.au/openconsultation.php.

Adam Brancher
Australian Maritime Safety Authority

MEMBERSHIP

Australian Division Council

The Council of the Australian Division of RINA met on Wednesday 19 June 2013 by teleconference based in Canberra, chaired by the President, Jim Black. Some of the matters raised or discussed during the meeting are outlined as follows:

Implementation of Single National Jurisdiction

Noting that the new system would enter force on 1 July, Council undertook to monitor the transition and requested members' feedback on its implementation to be forwarded to the Secretary. Members' input to the revision of NSCV standards would be welcomed and should also be forwarded to the Secretary.

The Walter Atkinson Award

Council appointed a committee to undertake assessment of papers nominated by the closing date of 15 July. The Award will be presented at the Pacific 2013 IMC in October.

Future Submarine Industry Skills Plan

This plan was released in May in conjunction with the 2013 Defence White Paper. Council agreed in-principle to make a submission to Government in relation to this plan and its implications for naval architecture in Australia.

PACIFIC 2013 International Maritime Conference

Council received a brief progress report on preparations for the Conference on 7–9 October in Sydney. That report can now be updated to advise that the deadline for submission of final papers has now passed; registration is open, although early-bird registration has closed (see www.pacific2013imc.com).

Certificates for Long-standing Members

Council observed that a practice had been developed by Headquarters in London to issue certificates to members commemorating their membership exceeding 45 years. Members who consider they should be eligible for such a certificate but who have not received one should contact the Secretary.

London Council Issues

Council was briefed on the main issues covered by the Institution's April Council meeting, including final preparations for the Annual General Meeting and Special General Meeting later that day, and planning for the relocation of Headquarters to 8–9 Northumberland Street, London, which has subsequently been completed.

Next Meeting

The next meeting will be held on Wednesday 18 September 2013 in Fremantle.

Postscript

It is with great regret that I learned, as this issue goes to press, of the passing of a Past President of the Institution, Mr Marshall Meek. Mr Meek was a long-standing supporter of the Division, and it was partly through his efforts that the Division was first represented on the Institution's Council. I personally experienced this support and Mr Meek's valued advice on that Council in 2003–07. He will also be remembered as the designer of many of the early container ships trading to Australia, and as author of the book *There Go the Ships*. My personal condolences go to his family.

Rob Gehling
Secretary

Continuing Professional Development

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

Continuing Professional Development will therefore enable the member to:

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

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

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

The Institution requires that CPD activities should be authenticated either by mentors, employers or the providers of CPD. Some informal learning activities may be self-authenticated. The roles of the mentor, employer and the Institution in assisting members to achieve their CPD are described in the *Guidance* document.

The Institution places an obligation on its members to plan and record their CPD and to produce evidence of their CPD achievement. The Institution may request to see a member's CPD Plan and Record at any time, and when upgrading class of membership.

RINA Council and Committee Members

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

Australian Division

President	Jim Black
Vice-president	Tony Armstrong
Secretary	Rob Gehling
Treasurer	Craig Boulton
Members nominated by Sections	
	David Sherwood (WA)
	Adrian Broadbent (NSW)

	Lance Marshall (Vic)
	Antony Krokowski (Qld)
	Ian Laverock (ACT)
	Alan Muir (Tas)
	Graham Watson (SA&NT)
Members appointed by Council	
	Tony Armstrong
	Danielle Hodge
	Craig Hughes
	Michael Mechanicos
	Vesna Moretti
	Jon Pattie
	Mark Symes

ACT Section

Chair	Bruce McNeice
Deputy Chair	Ray Duggan
Secretary	Richard Milne
Assistant Secretary	Kerry Johnson
Treasurer	Claire Johnson
Nominee to ADC	Ian Laverock
Members	John Colquhoun
	Richard Dunworth
	Ian Laverock
	John Lord
	Tim Lyon
	Michael Mechanicos

NSW Section

Chair	Alan Taylor
Deputy Chair	Valerio Corniani
Secretary	Anne Simpson
Assistant Secretary	Nathan Gale
Treasurer	Adrian Broadbent
Nominee to ADC	Adrian Broadbent
Auditor	TBA
TM Coordinator	Phil Helmore
Members	Craig Boulton
	Sue-Ellen Jahshan
	Graham Taylor

Queensland Section

Chair	Peter Holmes
Deputy Chair	Tommy Ericson
Secretary	Mark Devereaux
Treasurer	Gillian Carter
Nominee to ADC	Antony Krokowski
Members	James Stephen
	Jon Pattie

South Australia and Northern Territory Section

Chair	Graham Watson
Deputy Chair	Malcolm Morrison
Secretary	Danielle Hodge
Treasurer	Danielle Hodge
Nominee to ADC	Graham Watson
Members	Sam Baghurst
	Neil Cormack
	Peter Dandy
	Nik Parker
	Adam Podlezanski
	Jan Verdaasdonk

Tasmanian Section

Chair	Jonathan Binns
Secretary	Mark Symes
Treasurer	Jonathan Duffy
Nominee to ADC	Alan Muir
Members	Guy Anderson

Victorian Section

Chair	Karl Slater
Secretary	Simon Kelly
Treasurer	Sam Tait
Nominee to ADC	Lance Marshall
Members	Stuart Cannon
	Sean Johnston

Western Australian Section

Chair	Ben Fell
Secretary	Graham Jacob
Treasurer	David Sherwood
Nominee to ADC	David Sherwood
Member	Timothy Brazier
	Malcolm Waugh
	Matthew Williamson

The Australian Naval Architect

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

Walter Atkinson Award Committee

Chair	Kim Klaka
	Lance Marshall
	Vesna Moretti
	Alan Muir

RINA London

Council Members	Jim Black (*ex officio*)
	Rob Gehling
Safety Committee	Rob Gehling
High-speed Vessels	Tony Armstrong

RINA/Engineers Australia Joint Board of Naval Architecture

Members	Jim Black
	Robin Gehling

Pacific 2013 IMC Organising Committee

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

Standards Australia Committee AS1799 Small Pleasure Boats Review

Member	Doug Matchett
	Steven McCoombe

Standards Australia Committee CS051 Yachting Harnesses and Lines

Member	Bruce McRae

Changed contact Details?

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

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

RINA London		hq@rina.org.uk
Australian Division		rina.austdiv@optusnet.com.au
Section	ACT	rinaact@gmail.com
	NSW	rinansw@gmail.com
	Qld	m-dever@hotmail.com
	SA/NT	danielle.hodge@defence.gov.au
	Tas	mfsymes@amc.edu.au
	Vic	srkelly@globalskm.com
	WA	rina.westaus@gmail.com

Phil Helmore

VALE

James Henry Ritchie

It is with sadness that *The ANA* records the passing of James Henry (Jim) Ritchie on 18 June 2013 at North Shore Private Hospital, Sydney.

Jim was born in Glasgow on 16 September 1938 and began his career as a naval architect with Scott Lithgow, in Port Glasgow, Scotland. Scott Lithgow was formed in 1967 by the merger of Scotts Shipbuilding and Engineering Company and Lithgows, then nationalised and subsumed into British Shipbuilders in 1977. Reorganisation of Scott Lithgow in 1981 saw all the assets of its subsidiary companies transferred under the direct operational control of Scott Lithgow.

Jim came to Australia in 1981 at the invitation of John Doherty to work for M.J. Doherty and Co. in Sydney and to help with the design of two bulk carriers of 5000 dwt and 10 000 dwt for the Philippines, and his experience was invaluable in progressing these designs.

After M.J. Doherty, Jim worked with Bob Campbell and Nigel Offer at the Ship Technology Unit of Cockatoo Dockyard until Codock was closed.

He then pursued work outside of naval architecture for a few years, when he returned and took up contract work with the Commercial Vessels Branch of the Maritime Services Board of NSW. After the re-organisation of the MSB in 1994, Jim took up the position of Senior Naval Architect with the NSW Maritime Authority, and retired from that position in 2007.

Jim married Ailsa Richardson (deceased 2009) and is survived by their children, Bruce Ritchie and Jacqueline Holden (nee Ritchie) and beloved grandchildren Samantha, Jennifer, Joshua and Nicola.

Mori Flapan
Antony Krokowski
David Gosling
Phil Helmore

THE INTERNET

Report on *Costa Concordia*

The Italian Ministry of Infrastructure and Transport's *Report on the Safety Technical Investigation* into the Marine Casualty on 13 January 2012 of the cruise ship *Costa Concordia* is now available for download from the IMO GISIS (Global Integrated Shipping Information System) website, http://gisis.imo.org/Public/Default.aspx — click on Marine Casualties and Incidents. You will be required to register (simple enough) and this is good for accessing a lot of other information which is publicly available from IMO. You will then be able to access the report, a 181-page PDF file (7 MB). In addition to the full report, there are a further 66 annexes and appendices which you can down load if you like, all 1326 MB of them!

Graham Taylor

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, and the URLs are as follows.

Tim Haughton of Jotun Australia gave a presentation on *Developments in Marine Protective Coatings* to a joint meeting with the IMarEST attended by 22 on 5 June in the Harricks Auditorium at Engineers Australia, Chatswood. The webcast of the presentation is available at www.mediavisionz.com/ea/2013/easyd/130605-easyd/index.htm#.

Matt Duff of ASO Marine Consultants gave a presentation on *Conversion of a Gas Carrier to an FPSO* to a joint meeting with the IMarEST attended by 34 on 3 July in the Harricks Auditorium at Engineers Australia, Chatswood. The webcast of the presentation is available at www.mediavisionz.com/ea/2013/easyd/130703-easyd/index.htm#.

Gary Brassington of the Centre for Australian Weather and Climate Research gave a presentation on *Operational Ocean Forecasting: Status and Impacts* to a joint meeting with the IMarEST attended by 20 on 7 August in the Harricks Auditorium at Engineers Australia, Chatswood. The webcast of the presentation is available at www.mediavisionz.com/ea/2013/easyd/130807-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.

Phil Helmore

NAVAL ARCHITECTS ON THE MOVE

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

Ben Adamson moved on from Austal Ships three years ago, and has taken up a position as a naval architect with Braemar Technical Services (Offshore) in Perth.

Dion Alston moved on from Lloyd's Register many moons ago and took up a position as Design Manager with Hanseatic Marine, then consulted as Blowfly Design, and has now returned to Lloyd's Register to take up the position of Project Manager — Energy in Fremantle.

Dan Curtis has moved on within the Department of Defence and has taken up the position of Director Base Projects and Plans in Canberra.

Goran Dublevic has moved on from Sinclair Knight Merz and has taken up the position of Floating Systems IM Manager with Wood Group Integrity Management in Melbourne.

Gerard Engel has moved on from Austal Ships and has taken up the position of Senior Naval Architect with ONA Engineers in Perth.

Peter Henry has moved on from KBR/Granherne in Houston, Texas, and has taken up a position as Senior Naval Architect with the Amphibious and Afloat Support Systems Programs Office (AASSPO) of the Defence Materiel Organisation at Garden Island, Sydney. AASSPO provides in-service support to HMA Ships *Tobruk, Sirius, Success,* the Landing Craft Heavy class, the sail training ship *Young Endeavour,* and the Army marine equipment fleet.

Sue-Ellen Jahshan has moved on from Incat Crowther and has taken up a position as a naval architect with the Naval Platform Services division of Thales Australia at Garden Island, Sydney.

Mark Korsten moved on from Boartes Consulting in Doha, Qatar, many moons ago and spent a year with Maritime Surveillance and Compliance (Pacific Operations) in Sydney, a year as manager Pacific Maritime Security with the Australian Customs and Border Protection Service, two years as Maritime Policy Adviser with the United nations in Dili, Timor Leste, and has recently taken up the position of Consultant to PACOPS — Pacific Operations.

Campbell McLaren has moved on from Core Builders Composites in New Zealand and has taken up a position as a structural engineer with Premier Composite Technologies in Dubai, UAE.

Doug Matchett has moved on from Marine Safety Queensland and has taken up a position with the new Domestic Vessel Division of the Australian Maritime Safety Authority in Canberra.

Brocque Preece has moved on from the Department of Defence, and has taken up a position as a naval architect with Eagle, Lyon, Pope in London, UK. ELP is part of the Global Maritime Group, specialising in ports and harbour consultancy, including port development, vessel motions and risk analysis, for ports and harbours worldwide.

David Sherwood moved on from Thornycroft Maritime Australia many moons ago and is now consulting as Sherwood and Associates in Fremantle.

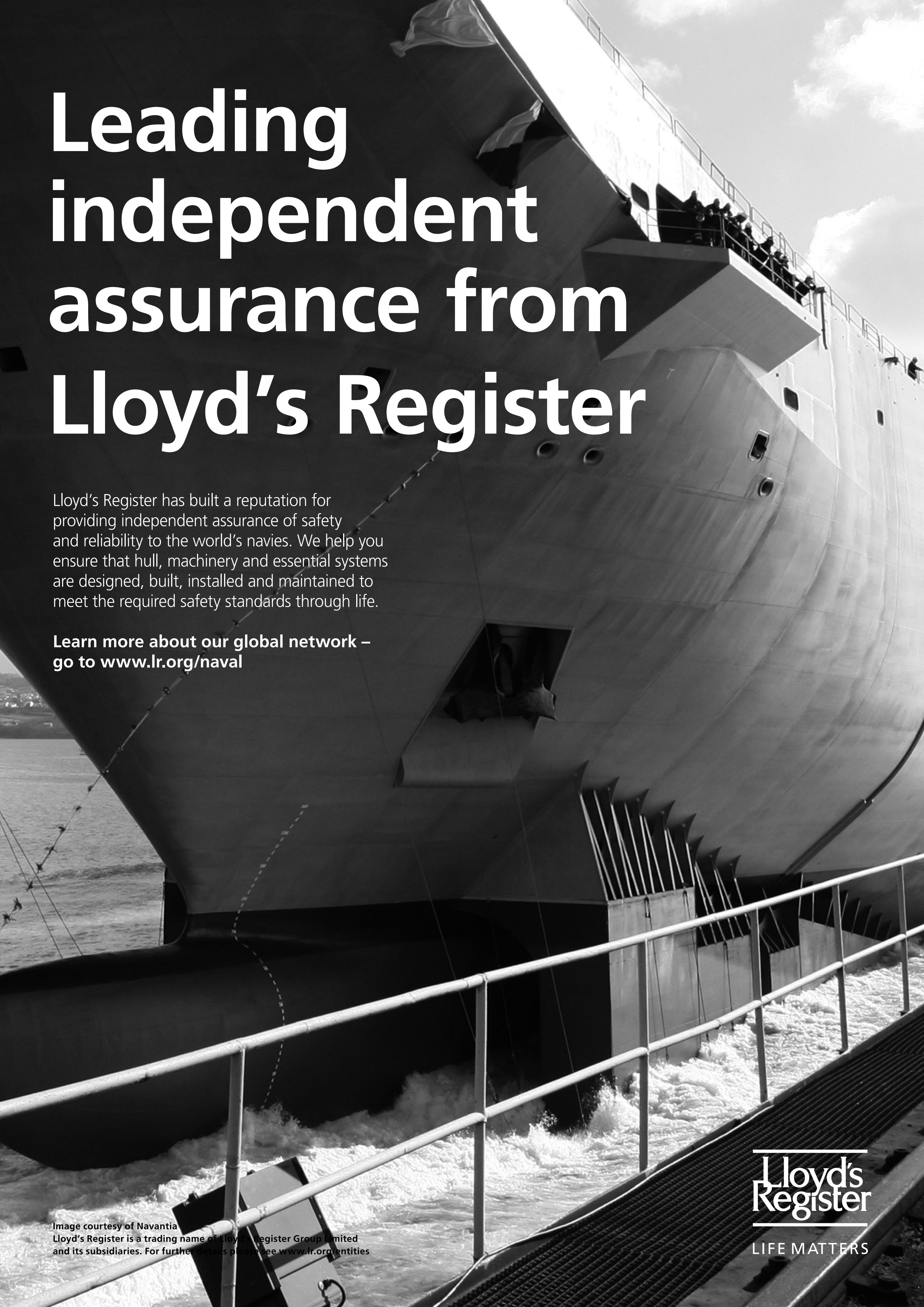
This column is intended to keep everyone (and, in particular, the friends you only see occasionally) updated on where you have moved to. It consequently relies on input from everyone. Please advise the editors when you up-anchor and move on to bigger, better or brighter things, or if you know of a move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

Phil Helmore

FROM THE ARCHIVES

Sydney Harbour, October 1913. The newly-arrived Flagship of the young Royal Australian Navy, the battlecruiser HMAS *Australia*. at anchor off Farm Cove with the cruisers HMAS *Sydney* and HMAS *Melbourne*. On 5 October 2013 the centenary of their arrival will be celebrated by the International Fleet Review with 42 warships, three civilian ships and 17 tall ships taking part

(RAN Historical Collection)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