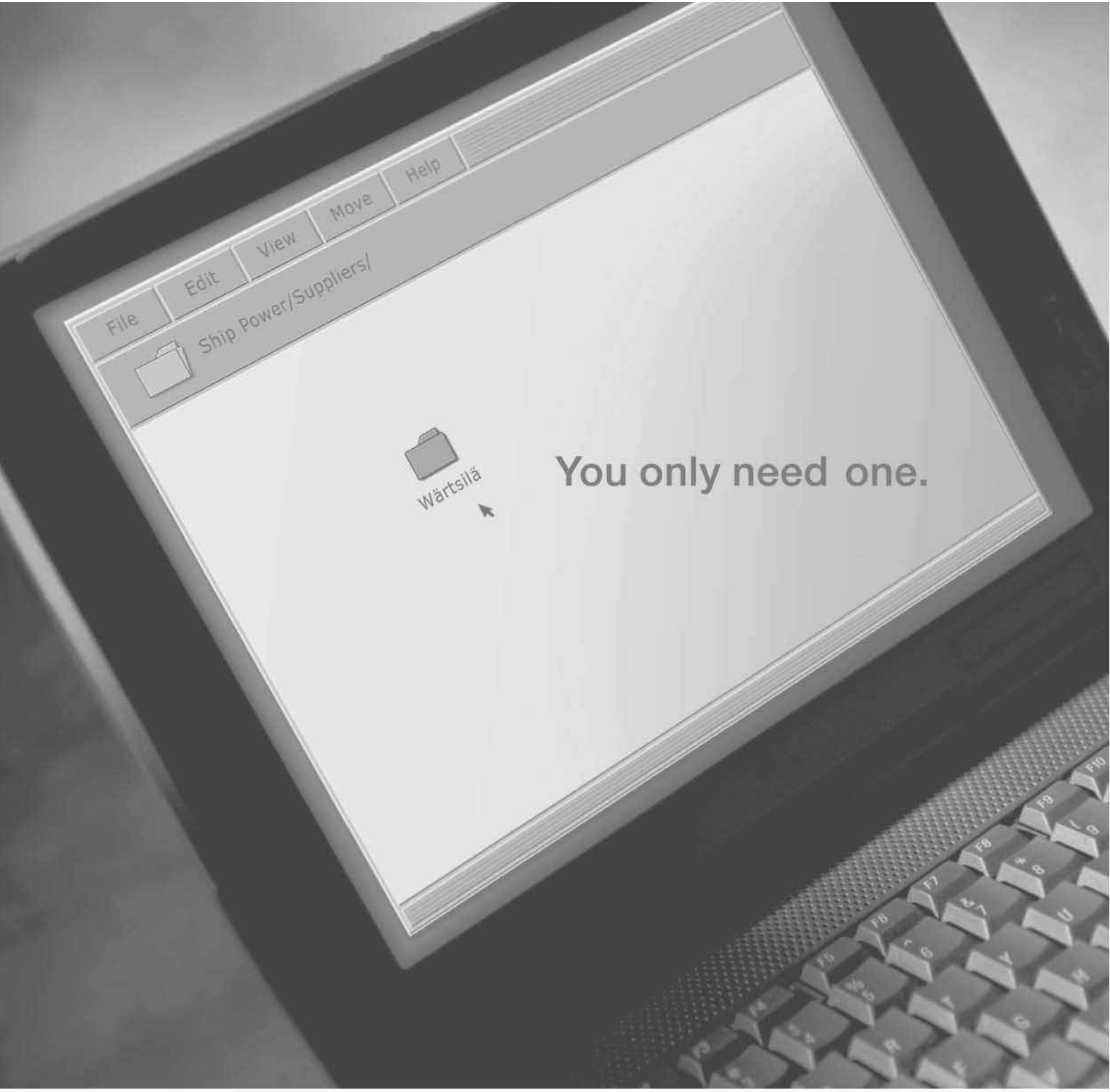
# THE AUSTRALIAN NAVAL ARCHITECT

Volume 10 Number 4
November 2006

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# THE AUSTRALIAN NAVAL ARCHITECT

Journal of
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**(Australian Division)**

Volume 10 Number 4
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*Cover Photo:*

The Australian National Maritime Museum's destroyer *Vampire* approaching the Captain Cook Dock at Garden Island for docking (Photo John Jeremy)

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## CONTENTS



**RINA Australian Division**
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# From the Division President

I thought that in this edition, for a change from the normal fare of this column, I'd regale you with some of the outcomes from my travels during September to the National Marine Safety Committee's Marine Safety Conference 2006 – *Towards 2010* on the Gold Coast and the 9th International Conference on the Stability of Ships and Ocean Vehicles (STAB 2006) in Rio de Janeiro.

Firstly, I would like to bring to your attention the excellent occasional series on forensic naval architecture penned in this journal by my friend, mentor and pillar of the Division, Bob Herd. While he hasn't been well of late (I trust you get over this health hurdle soon, Bob), he has had a long connection with the subject matter discussed below in relation to both of these conferences.

You may recall that, a couple of years ago, I coordinated a submission to NMSC in which I attempted to channel the disparate views of our members into a cohesive view on the basics for the new scantling requirements of the National Standard for Commercial Vessels. I have to say that this submission was heavily influenced by some of my own views and that dissenting preferences were expressed by some members, both in the forums that we conducted in Sydney and Fremantle and in the workshop held in Brisbane under the auspices of the NMSC.

Maybe as a result of this RINA submission, I was asked to be part of a panel at the NMSC conference to discuss subsequent developments in this work whereby Lloyd's Register has won a tender to supply its structural rules and appropriate technical support as part of the National Standard for Commercial Vessels. While this approach is in conflict with the RINA submission's support for continuation and extension of the AS4132 standards, it is my view that the outcome will provide the designer with a "reliable black box" which will define acceptable scantlings for all common ship- and boat-building materials. There was no dissent from this conclusion at the NMSC Conference.

Another issue that received an airing at the conference was a discussion led by Mori Flapan seeking to answer the question "who is a surveyor?" As the outcome was that we can't yet get a better answer than "someone who does surveys", this issue probably has a fair distance to run.

All in all, the NMSC conference provided a very interesting glimpse into the future of the Australian marine industry, from the recreational sector through to the commercial side.

I attended the STAB 2006 Conference in the role of Chairman of the IMO's Sub-committee on Stability and Load Lines and on Fishing Vessel Safety (SLF), which I've carried since 2005.

As a student, I was taught that parametric rolling was an operational phenomenon that needed to be borne in mind in following and quartering seas, when the wave encounter period roughly equals the ship's natural roll period, as demonstrated by the historic San Francisco Bay containership experiments by Bob Herd's longtime friend, Professor Randolf Paulling. Little did I know that, in 1996, I'd be attending a ship that had suffered severe parametric rolling and lost or damaged many deck-stowed containers while punching into a late-winter cold front in Bass Strait. At the time, I could not work out why the ship was rolling so severely while hove-to. But this was two years before the C11 containership incident in the northern Pacific which has subsequently been well investigated and reported.

This subject dominated the first two days of STAB 2006 and I would refer anyone wanting more information about parametric rolling to the conference papers. I was left, however, with the feeling that, while we now know a lot about the theory of this phenomenon and can model it in up to six dimensions, there is a real need for this knowledge to be translated into guidance material which a master can use to clearly identify when it's occurring (coupled pitching/heaving and rolling, with two wave encounters for every roll period cycle) and take appropriate navigational measures to reduce the rolling. I'm confident that my Sub-Committee at IMO will soon produce such ship-specific guidance.

Professor Paulling was there too, billed as a keynote speaker. The conference was a real eye-opener in terms of showcasing modern stability-related tools, not the least of which was the Federal University of Rio de Janeiro's ocean basin, which would have to be a hydrodynamicist's dream.

For me there were two highlights to the conference, both involving damage stability.

You may be aware that, under amendments to the SOLAS Convention coming into force on 1 January 2009, harmonised probabilistic sub-division and damage stability requirements will apply to all (SOLAS) passenger ships and to SOLAS cargo ships in excess of 80 m in length. New passenger ships are already required to be subjected to evacuation analysis. In a further measure, as part of its initiative to improve the safety of new passenger ships, especially large ones, IMO has recently been examining calculation of "time to flood" for such ships. While laudable in themselves, each of these measures seemed to me to be separate. That was until three papers at STAB 2006, which proposed variations of an holistic approach whereby the safety of a passenger ship would be determined by a combination of event probabilities covering the sequence of events from damage (or fire) occurring, surviving that event, being able to safely evacuate into survival craft, and the safe rescue of survivors. I believe that development of such an approach is where the future improvement of ship safety lies in an international context.

The existing elements of this "toolbox" were demonstrated in a workshop by one of two separate teams who have been contracted by Sweden, operating in parallel, to forensically examine the loss of the passenger ro-ro ferry *Estonia*. While the teams are restricted in their ability to gather new evidence from witnesses, their work using "time to flood" and evacuation modeling seems to be discounting some conclusions reached by the previous inquiries into this tragedy. So huge strides are being made in forensic naval architecture and, no doubt, there will be more!

My trip to Rio was paid for by AMSA as my employer. But by the time you read this I will have retired from AMSA and, as far as members are concerned, my present work contact details will no longer apply. If you need to contact me, and can't do so any other way, Keith Adams will have my details.

*Rob Gehling*

# Editorial

In August this year the Institution lost one of its hardest workers in Australia — Alan Mitchell — who had been Honorary Secretary/Treasurer of the Australian Branch/ Division for 27 years. Alan devoted many hours of his time to the work of the Institution. I worked with him for many years, both on Institution matters and at the dockyard where we were both employed. His contribution to our affairs and support of the seven Presidents with whom he worked was outstanding — we will miss him. I was honoured to be able to pay tribute to Alan at his funeral on 18 August.

Alan enjoyed his work for the Institution, finding, like many of those who become so involved, that it was interesting and rewarding. As with many things in life, you usually get out at least as much as you put in. Some of us have been around for a long while, and new faces are taking our places on the Division Council and Section Committees, as they should. However it is disappointing to me that attendance at technical meetings, at least in Sydney, so poorly represents the younger members of the Institution. Moreover, very few speakers today take the trouble to present a formal paper to the Institution. We do our best to report on technical meetings, when we can, but it is no substitute for a properly-presented paper which may be made available to a wider audience through the Institution's journals. There will be no Walter Atkinson Award for 2005 — there were no nominations.

I would like to hope that more young members of the Institution in Australia will become inspired to contribute to our activities and follow the example of Alan Mitchell, and others, as we rapidly advance into the twenty-first century.

This edition is the last for 2006 and the last for Volume 10 of *The Australian Naval Architect*. It was a bold decision in 1997 to introduce a quarterly Australian journal to supplement the excellent UK publications of the Institution, particularly one to be produced on a voluntary basis. Phil Helmore and I have been producing *The ANA* since July 1998 and every three months we wonder how we will ever fill the next one — but it happens. We could not do it without the support of our correspondents and I would like to take this opportunity to thank everyone who has contributed to our journal over the last ten years. Please keep it up.

The production of *The ANA* would also not be possible without the support of those companies that advertise each quarter and make it possible to publish *The ANA* at a low net cost to the members. We are very grateful for their continued support.

*John Jeremy*

# Letters to the Editor

Dear Sir,

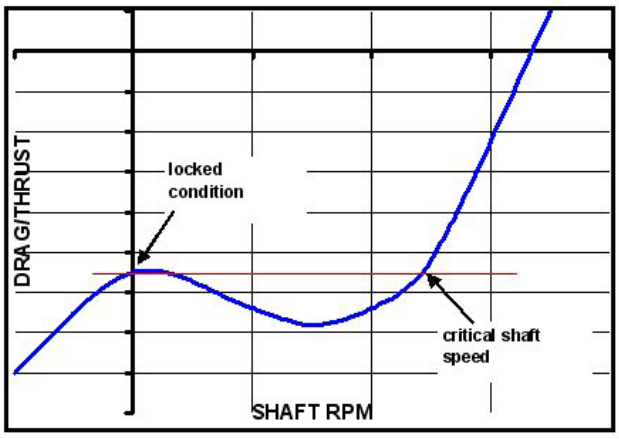
The article by Kim Klaka, *Which has Less Drag –– a Fixed Prop or a Rotating Prop?*, in the August 2006 issue of *The ANA* prompted me to dust off an old industrial training report which I prepared in 1985.

My report on the subject grew from an interest in the possible application of auxiliary power generation from a freewheeling propeller. There was very little information available at the time with simplified keywords like "windmilling" or "freewheeling", so it was necessary to look for other sources which might have the requisite data, but in another form. Also, these two terms do not always have the same meaning in the available literature; windmilling is sometimes defined as driving a redundant propeller so as to produce no net thrust.

Kim's comment "it never ceases to amaze me how much useful work was published in the 1930s" should have been the cryptic clue as to where to start looking. Conn (1935) published a paper in which he studied the effectiveness of a range of propellers when running astern, but covering both the backing and the braking conditions (positive and negative advance coefficients). There were two separate experiments; a series of open-water propeller tests to measure torque and thrust under different conditions, and a series of self-propelled model tests where the model was towed in a towing tank to maintain a constant speed whilst being driven.

Conn was not interested in the locked or freewheeling conditions, but rather the efficiency of the different propellers when backing. However, both the locked and freewheeling conditions are covered by the data. Although the types of propellers which Conn tested were not particularly indicative of fixed-blade yacht propellers (which usually have two or three blades, a modest BAR of about 0.3 to 0.4 and P/D ratio of about 0.6 to 0.8), merchant vessels of the 1930s were characterised by deep, narrow hulls (hence few diameter restrictions) and modest engine power. Typical propellers used in the study were 3 and 4 bladed propellers with BARs of 0.4 to 0.5, but with P/D ratios close to square.

The resultant thrust and torque coefficients did show an inflexion about the zero advance coefficient point (the locked condition), but this was glossed over in the discussion.




Propeller thrust/drag against shaft rpm
(After Conn, 1935)

For a constant vessel speed, a plot of propeller thrust/drag against shaft rpm exhibits the same inflexion in Conn's curves, as shown in the graph. As shaft rpm is increased from the locked (zero rpm) condition, the propeller drag actually increases for some time before decreasing as the system gradually returns to positive propulsion. The curves imply a critical shaft speed, above which it is better to freewheel and below which it is better to lock. There is also a non-linear shift in this critical shaft speed with increasing vessel speed, so that it might be that a locked propeller is better at low speed, and freewheeling is better at higher speeds where the shaft speed may be above the critical speed.

Also, there was a fairly tenuous relationship between increasing P/D ratio and increasing critical shaft speed, though the data is very limited.

Phillips-Birt (1976) also analysed Conn's work and presented a table for a 28 in (711 mm) diameter propeller with 29 in (737 mm) pitch moving ahead at a speed of 7.5 kn. This clearly demonstrates a critical shaft speed, above which the freewheeling condition results in reduced drag.

**Phillips-Birt, Table 21, page 213**

| RPM | 0 | 50 | 100 | 150 | 200 | 250 | 270 |
|---|---|---|---|---|---|---|---|
| Resistance (lbf) | 480 | 525 | 600 | 480 | 290 | 50 | 0 |
| (kN) | 2.14 | 2.34 | 2.67 | 2.14 | 1.299 | 0.22 | 0 |

Additional information can be found in Robinson (1916) and Hammitt (1975). Robinson was interested in electric propulsion and made the observation that "it requires a greater torque to bring the screw to rest than it does to hold it at rest". Hammitt presents equations for calculating the power required in the locked and freewheeling conditions, and makes the observation that a powerless helicopter must freewheel the rotors to slow the rate of descent (thereby extending the period of terror before crashing to your death?)

In the end, reality overwhelms theory. As Kim pointed out, unless a trailing oil pump is fitted to the gearbox, the shaft should be locked to avoid gearbox damage. Similarly, many of the cheaper face-type shaft seals and water-lubricated bearings may deteriorate rapidly without water injection.

**References**

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*Greg Cox*

Dear Sir,

I was interested to read the contribution in the August 2006 issue of *The ANA* by Kim Klaka, *Which has Less Drag -– a Fixed Prop or a Rotating Prop?*, addressing the question of the comparative drag of locked versus windmilling marine propellers. As Kim noted, this seems to be a frequently-raised question. For many marine applications there is good guidance available in the form of the four-quadrant data gathered for a range of Wageningen B-Series propellers (van Lammeren et al., 1969). This invariably shows that a propeller that is free to rotate with minimum resisting shaft torque will have significantly less drag than the equivalent propeller on a locked shaft.

The four-quadrant data presents non-dimensional thrust (or drag) and torque acting on a propeller across the full range of open-water operating conditions covering both ahead and astern shaft rotation, and ahead and astern ship motion. The data is therefore useful for such applications as generating estimates of the stopping performance of ships but, equally, for predicting the performance of ships that are trailing a propeller, whether locked or free to windmill. The use of such data is well described by Carlton (1994).

The four-quadrant performance data was gathered for only a limited subset of the entire B-Series; however, this subset covered:

- a range of P/D values from 0.5 to 1.4 for one Z and Ae/Ao (B4.70);
- a range of Ae/Ao from 0.4 to 1.0 for Z=4 and P/D=1.0; and
- a range of Z from 3 to 7 for P/D=1.0 and Ae/Ao values in the range 0.65 – 0.85.

In principle, it should be possible to cross interpolate this data set to estimate the four-quadrant performance of most practical combinations of Z, P/D and Ae/Ao. Indeed, as reported by Roddy et al. (2006), neural networks have been applied to successfully develop a prediction method for four-quadrant performance based on input of these propeller parameters.

The case of a ship with forward motion and a locked propeller shaft is represented by the data points at an advance angle ($\beta$) at the 0.7R position on the blade of 90 degrees. For the case of the B4.70 propeller, it can be seen from a four-quadrant chart that, in the range of P/D from 0.5 to 1.4, the drag of the propeller remains fairly similar, with the highest-pitch propeller having about 20% less drag than that of the lowest pitch. On the other hand, the torque required to keep the shaft from turning on the highest-pitch propeller is more than double that acting on the lowest-pitch propeller. This tends to support the conclusions noted at the end of the second paragraph of Kim's contribution.

The case of a windmilling propeller on which there is minimal resisting shaft torque is represented by the data points at an advance angle between about 20 to 40 degrees, depending on P/D. In this condition, it can be seen that both the thrust and torque coefficient curves cross the X-axis at roughly the same location, suggesting that there is minimal drag associated with a windmilling propeller provided that the resisting shaft torque remains low.

We recently had the opportunity to undertake first-of-class trials on a patrol boat to assess propulsive performance under a range of propulsion configurations, including with both shafts driving the ship, with one shaft driven and the other locked and, finally, with one driven and the other trailing but free to windmill. The results clearly demonstrated the drag penalty associated with a locked propeller compared to that of a propeller free to windmill, with a 2.2 kn speed penalty for a given propeller RPM on the driven shaft. A numerical analysis of the resistance and propulsion of the boat, in part utilising the four-quadrant data, was furthermore shown to give very good correlation with the trial results.

Kim raised the issue of the difficulty of predicting the resistance of a yacht propeller (presumably a two-bladed propeller) which is aligned to be in an aperture. In principle, if a reasonable estimate or measurement of the average wake fraction can be made in this region, it should still be possible to use the four-quadrant data (extrapolated to the two-bladed propeller case) combined with that local advance velocity to make an approximate estimate of the resistance of a locked propeller aligned within an aperture.

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Roddy, R.F., Hess, D.E. and Faller, W. (2006), Neural Network Predictions of the Four-quadrant Wageningen Propeller Series, *David Taylor Model Basin Report NSWCCD-50-TR-2006/004*, April.

*Martin Grimm*
Navy Systems Branch, Canberra

Dear Sir,

I would like to reply to Regina Lee's letter in the February 2006 issue of *The ANA* on the lack of research on and innovation in environmentally-safe vessels.

A German company called SkySails, located in Hamburg, is developing, manufacturing and distributing towing-kite propulsion systems for modern shipping. As a result, ship operations will become more profitable, safer, and independent of declining oil reserves. The planned product range is for towing-kite propulsion systems with a nominal propulsion power of up to 5000 kW. On average, annual fuel costs can be lowered by 10–35%, depending on actual wind conditions and actual time deployed. Under optimal wind conditions, fuel consumption can temporarily be reduced up to 50%. It is SkySails' aim to reduce fuel consumption of modern shipping by the utilisation of environmentally-friendly free-of-charge wind energy.

From the second half of 2006, pilot systems for superyachts will be available. In 2007 the first systems with towed-kite areas of up to 320 m² for cargo vessels will be available. In 2007 series production systems for super yachts and in 2008 for cargo vessels will commence. The system consists of a fully automated towed-kite propulsion, and a wind-optimised routing system.

It is used offshore, in addition to the propulsion of the ship's engine, if the wind conditions allow. Virtually all cargo ships can be retrofitted with the SkySails technology.

The SkySails technology differs from conventional sailing systems, which fit the sail to a mast and thereby connect it to the ship, in that the towing kite of the SkySails system is connected to the ship via a towing rope. Sail area and ship are thus separate from each other. The resulting characteristics of the technology offer ships an auxiliary wind propulsion with an entirely new performance spectrum: high performance, high practicability and high safety.

Maybe it is not the perfect solution, but for us as naval architects, it offers potential for the future.

*Daniel Mack*
UNSW Student

Dear Sir,

As a student living in Manly, I have the privilege of commuting on weekdays to university by way of the Manly ferry, one of several harbour runs operated by the now-corporately-owned Sydney Ferries Corporation.

As a regular commuter on the run and a keen observer of ferry mishaps and boating accidents, I am disappointed by the lack of a clear course for the corporation's future. As the sole owner of the corporation, the State Government has an obligation to fully research any course of action before implementing it. This has not happened on previous occasions.

The JetCats and SuperCats both suffered as a result of interference in the design process by government authorities, and in both cases ended up costing the taxpayers significantly more than originally planned.

I am even more sceptical about the Opposition's promise to build a fifth Freshwater-class ferry if elected, hoping to eliminate the reliability and maintenance-cost problems which are currently slowing any forward progress. A fifth ferry will only add to any costs, something that will ultimately become apparent after more fare increases.

I can only hope that Sydney Ferries Corporation can become more independent of the Government and, finally, able to make independent decisions which are not influenced by Macquarie Street.

*Nick Kitching*
UNSW Student

# THE AUSTRALIAN NAVAL ARCHITECT

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

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

Many people use Microsoft Word, but illustrations should not be incorporated in the document.

*Photographs and figures should be sent as separate files with a minimum resolution of 150 dpi. A resolution of 200–300 dpi is preferred.*

# NEWS FROM THE SECTIONS

## ACT

The ACT section held a dinner in conjunction with IMarEST on 24 August at the Embassy Motel in Canberra. Twenty-five members and wives attended and were entertained with a presentation by Alan LeLievre, currently Officer-in-Charge of Australian Federal Police Water Operations (Water Police and Divers).

Alan is Project Manager of six AFP maritime procurements, ranging from police patrol vessels with highly-specialised customised equipment to rigid-inflatable craft for beach landings in surf when required. He gave a revealing insight into the procurement process, especially the requirements definition and trials phases of these projects. Our thanks go to Greg Hellessey of IMarEST for making the arrangements with Alan.

Like so many others, Roger Duffield is moving to Adelaide with the AWD project. We wish Roger well in his new position and thank him for his valuable contribution as Treasurer and Secretary of the Section over the past few years. It appears that the South Australian section will be expanding considerably in the future. Joe Cole has kindly agreed to take on the Secretary's duties.

The forthcoming technical program includes presentations on WIG vehicles in November, the Sinking of HMAS *Sydney* in January, and the tanker conversion project and Russian Hydrofoils later in the first half of 2007.

*Dave Magill*

## Victoria

### Marine Casualty Investigations in Australia

On 10 August Mr Kit Filor, who recently retired as the Deputy Director, Surface Safety at the Australian Transport Safety Bureau, made an excellent presentation on marine casualty investigations in Australia. He has been responsible for over 150 marine accident investigation reports since 1986.

Kit examined the trends in marine casualties over the past 20 years and the changing attitudes which affect safety at sea. His presentation started with the grounding of the Australian bulk carrier, *TNT Alltrans*, in the early hours of 25 March 1985. The incident was a watershed in terms of marine-accident investigation in Australia. Part of the "fall out" from the judicial process, as thorough and exhaustive as it was, was an examination of the way in which Australia investigated accidents.

Kit discussed the concept of an independent "no fault" marine-accident investigation body which was given impetus by the foundering of the bulk carrier, *Singa Sea,* in July 1988 with the loss of 19 crew. He focussed on the role of the Department as the survey and the search and rescue authority as well the investigator, an issue which raised potential conflicts of interest.

The investigation into the loss of the *Singa Sea* was the first investigation which, together with the subsequent investigation into the structural failure of the Greek-flagged tanker, *Kirki*, led, or fed into, the Parliamentary inquiry into ship safety, the *Ships of Shame* report.

As the loss of bulk carriers abated, at least in the Australian theatre, so the investigation focus changed. Groundings focused on issues of how bridge teams operated. A number of engine-room fires led to a close examination of fuel systems. More recently, more emphasis has been placed on collisions and accidents involving life-saving appliances.

Kit was thanked for a very interesting and thought-provoking presentation.

### Port Phillip Channel Deepening

The October technical presentation was made by Nick Easy on the Port Phillip Channel Deepening project. Nick is currently the Executive General Manager for the project.

The presentation started with a description of the importance of the Port of Melbourne in terms of the local and Australian economies. This led to a description of the main anticipated economic benefits following completion of the dredging. Nick went on to focus on the key technical and environmental challenges that needed to be addressed.

The risk-mitigation strategy was to complete a trial dredging operation which was described in detail with the associated technologies for carrying out the operation. On completion of the trial operation, most of the issues raised were quantified and complied with the plan. This included social studies, dredged material management, channel stabilisation and other areas for scientific study.

Overall the presentation was excellent and raised many of the issues currently being aired in Victoria.

### Annual General Meeting

The Annual General Meeting of the Victorian Section was held following the October technical presentation. Other than routine matters, new committee positions were elected as follows:

| | |
|---|---|
| Chair | Samantha Tait |
| Secretary | Vacant (Sam Tait will continue activities) |
| Treasurer | Ken Hope |
| AD Council Nominee | Stuart Cannon |
| Members | Goran Dubljevic |
| | Craig Gardiner |
| | Sean Johnston |
| | Alan Taylor (dual IMarEST representative) |
| Website Manager | Craig Gardiner |

The next technical meeting is scheduled for 14 December 2006. The venue is the Sinclair Knight Merz Theatrette at 590 Orrong Road, Armadale. Members meet at 1730 for an 1800 start. The committee would like to welcome all members, and will be adjourning to the pub next door for Christmas drinks afterwards.

*Stuart Cannon*

*This makes Samantha the first female Chair of an Australian Section of RINA; congratulations Sam!* — Ed.

## New South Wales

### NSW Section Committee Meeting

The NSW Section Committee met on 26 September and, other than routine matters, discussed:

- SMIX Bash 2006: Continuing support from sponsors; model-making is under way.
- Technical Meeting Program for 2007: Topics proposed and authors to be approached.
- Venue for TM Program in 2007: Attendances have dropped since Engineers Australia moved to Chatswood; other venues around North Sydney discussed and to be investigated.
- Budget for 2007: Draft budget for 2007 prepared.
- Finance: We currently have $1489 in the bank, made up of $1643 in the Social Account (including SMIX Bash monies), and the Section Account $154 in the red; i.e. the social account is keeping the section account afloat.

### Salvage of *Jodie F. Millennium*

John Willy, National Operations manager for OOCL Australia, gave a presentation on *The Salvage of* Jodie F. Millennium *at Gisborne, NZ* to a joint meeting with the IMarEST attended by twenty-three on 8 August at Engineers Australia, Chatswood.

#### Introduction

John began his presentation by saying that salvage operations are very intense, with lots happening at a very fast pace. It is essential for everyone to carry a notebook to jot down what has been decided so that all march to the same tune. It also comes in handy later on for recalling the details, and the sequence of events!

#### The Grounding

John then showed a slide of the location of Gisborne, which is on the north island of New Zealand, part way round the broad, sweeping arc where Poverty Bay indents the North Island's east coast, at the entrance to the Turanganui River. Gisborne is a small port, protected by a breakwater. The channel is 10.4 m deep at low water, 91.5 m wide, and 0.6 n miles to the entrance buoy. The wharves and piers are in a direct line with the channel entrance. Much of the port's exports consist of radiata pine logs, mostly to South Korea and Japan.

*Jodie F. Millennium* is a 255 000 tdw geared (i.e. with own loading/unloading gear) bulk carrier, built in 2000, which was loading a cargo of 22 070 t of pine logs at Gisborne when a storm passed to the east. The storm resulted in 8 m waves outside, and a 3 m swell at the wharf. The vessel began surging against the wharf and then, with surging increasing, extra mooring lines were attached. Some of these ended up broken, and at 2200 on 6 February 2002, the ship was ordered to put to sea to prevent damage to the wharf. The pilot disembarked as the vessel cleared the wharf and, on passage to exit the channel, the vessel struck bottom at 2230. This bent the rudder stock to starboard, and the ship veered into shallow water on the inshore (starboard) side, and tugs could not refasten the tow. The ship sat and pounded further ashore, ending up just 300 m off Waikanae Beach.

This was always going to be a difficult salvage, as there were breached tanks and oil pollution control to be considered, the bad weather continued for about two weeks, the ship dug a hole for herself, and there were obstacles (a pipeline and a sewage outfall) to be cleared to extricate the vessel.

However, the news wasn't all bad; the vessel was close to port and civilisation, so logistics were not the problem that they can be in a remote region. The ship's engine room had not been flooded, so the ship had its own power, which meant hot food, showers and the like, which are luxuries to be dreamed of on some jobs. And, in a strange quirk of fate, John arrived last of the salvage team, but ended up with the best accommodation!

#### The Salvor

United Salvage is a salvage company which is wholly owned by Adsteam Marine. The salvage team comprised the Salvage Master, Capt. David Hancox, the Senior Salvage Engineer, Mr Trevor Cosh, plus 8–10 others including a naval architect (on board the casualty), and the Commercial Director, Capt. Ian Hoskinson plus one other (ashore).

A salvage master from the UK, Capt. Simon Evans, was also present on this job, and it was interesting to compare notes on the differing approaches in the UK and Australia.

#### LOF 2000 with Scopic Clause

The standard contract for salvage operations is Lloyd's Open Form (LOF) 2000, which is an undertaking for "no cure, no pay". The salvage reward is then determined by Article 13 of the *International Convention on Salvage 1989*, which considers how difficult the operation was, and the risk to which the salvor was exposed. Article 14 considers the compensation which should be paid for averting an environmental disaster, and is a top priority these days.

The Scopic Clause is an innovation in LOF2000, and it is either invoked entirely or not at all by a simple statement Yes/No statement; i.e. it is an option. The Scopic Clause puts the salvage on a contract basis, with agreed tariff rates, and the salvor then needs to keep a tally of expenses so that there is no argument at the end.

If the Scopic Clause is invoked and the Scopic costs are greater than Article 13 costs, then the salvor is awarded the Scopic costs. However, if the Article 13 costs are greater than the Scopic costs, then the salvor is awarded the Scopic costs plus 75% of the difference. For example, if the Scopic clause was invoked, and the Article 13 costs were assessed at $20 million, and the Scopic costs at $10 million, then the salvor would be awarded $10 + 0.75×(20-10) million = $17.5 million.

In this case, the Scopic Clause was invoked by the salvor.

#### Damage Survey and Mobilisation

Capt. Hiscox arrived on board the vessel with the advance salvage team on 8 February. Inspection showed the deck to be covered by the cargo of logs, which had to be scrambled over, or a passage forward-and-aft negotiated *outside* the bulwark rail! Both anchors were lost, the rudder stock was bent and twisted (an had lifted the carrier bearing), the solepiece was pushed up, the steering gear inoperable, the propeller blades bent, some double-bottom tanks breached, the bottom plating severely damaged, and the side plating heavily indented.

The first priority was to prevent oil pollution, and this would

be done via some internal transfer, and the remainder by external transfer. Heavy fuel oil was pumped directly into RIBs owned by the MSA, and these vessels shuttled the oil out to the RNZN tanker, HMNZS *Endeavour*, which anchored about 500 m away. These vessels moved about 10 t at a time, so they were substantial RIBs!

The salvor also needed to mobilise equipment for the salvage (tugs, ground tackle, etc.) and to conduct a hydrographic survey of the area so they could determine the best exit path. John, with an eye to the well-being of all, ordered crates of Mars Bars and Picnics, for everyone to keep their energy levels up!

Assets mobilised for the salvage operation included:

| | | |
|---|---|---|
| *Pacific Chieftain* | OSV | 75 t bollard pull |
| *Keera* | Tug | 50 t bollard pull |
| *Seatow 25* | Tug | 50 t bollard pull |
| *Seatow 22* | Tug | 30 t bollard pull |
| *Titirangi* | Tug | 30 t bollard pull |
| *Turihaua* | Tug | 20 t bollard pull |
| *Seatow 17* | Dumb barge | |

Gisborne pilot vessel
MSA RIBs (3)
Helicopters (3)
Air compressors (3)
Pumps (air diaphragm and submersible)

**First Attempt**

Preparations for refloating commenced on the day of arrival at the vessel. *Pacific Chieftain* arrived on 11 February, and took up a static tow, holding position after the passing of lines by the Gisborne pilot vessel.

At departure from Gisborne wharf on 6 February, the drafts were a maximum of 9.5 m. On 9 February they were estimated to be 9.91 m forward and 10.9 m aft, giving a displacement of 32 984 t and indicating that 3925 t of seawater had been added since grounding. However, the vessel had listed towards the shore, and dug its own trench with the starboard bilge. The vessel's TPcm was about 35 and, with a predicted water depth of about 8.9 m, the calculated ground reaction was bout 450 t. They had about 105 t of bollard pull available at that stage, and the signs were good for a refloating attempt. The vessel's heading was 256°T, and the plan was to swing to 180° and tow/gouge the way out.

At 0430 on 13 February they began blowing air into breached tanks and dumping ballast. High water of 1.7 m was at 0830, and *Pacific Chieftain* and *Seatow 22* took up the strain, but at 0900 the vessel was still stuck fast on a heading of 237°, so they ballasted back up and sat the vessel down to limit the movement. The vessel was almost afloat in the trench at high water.

**Second Attempt**

Between 1427 and 1855 that day, the helicopters lifted off 206 t of logs from No. 1 hatch to lighten the vessel for another attempt at the next high water. At 2014, *Pacific Chieftain* and *Seatow 22* took up the strain at 40% power, but the weather intensified and the wind increased to 40 kn with increasing swell, so that *Jodie f. Millennium* became "lively", and in danger of further bottom damage. Swells began breaking over the forecastle, and the bow was being pushed towards the sewage outfall, which they could not risk damaging, and so the vessel was ballasted back down. 13 February was a long day!

**Third Attempt**

Between 0735 and 1134 on 14 February, the helicopters lifted off a further 195 t of logs from the deck. At 1150 they commenced blowing ballast, and *Pacific Chieftain* and *Seatow 22* took up the strain and increased to 45% power. At 1240, *Pacific Chieftain*'s towline parted, which was a major loss in towing power, and the ballast tanks were vented. They had reduced the vessel's heading to 235° but, by 2400, this had slipped back to 257°.

**Fourth Attempt**

In preparation for the next attempt, the decision was made to lay ground tackle so that the ship could assist the operation by hauling herself. Two 9 t anchors (from the Russian passenger vessel which sank in Cook Strait) were laid piggy-back fashion (i.e. in series) about 500 m from the vessel, and a block-and-tackle system set out on the foredeck. John showed slides of the proposed system in his notebook as they were planning it, and then pictures of the equipment as set up on the foredeck.

On 18 February, *Keera* arrived from Melbourne to add another 50 t to the bollard pull from *Pacific Chieftain* and *Seatow 22*. All connected up and waited at anchor, ready for another attempt at the next high water which was predicted at 1.9 m.

At 0430 on 19 February they commenced dropping ballast, and then had three tugs hauling and the ship hauling herself on the ground tackle. They reduced the heading to 216°, but by 1220 the tide was falling and so they ballasted back up again.

At 1930 the dumb barge, *Seatow 17*, arrived and began to help by taking more logs off.

**Fifth Attempt**

On 20 February the predicted high water was 1.8 m at 1217, and by 0810 they had removed a further 1708 t of logs. At 0854 they commenced blowing ballast and later the tugs took the strain. At 1009 the towline to *Keera* parted, but they continued with *Pacific Chieftain* and *Seatow 22*. By 1230 there had been no progress and so, on a falling tide, they re-ballasted.

However, at 0320 (after the next high water) movement was detected forward, and so *Keera* was instructed to re-connect.

*Seatow 17* continued taking logs off, assisted throughout by the three helicopters airlifting logs ashore.

**Sixth Attempt**

*Pacific Chieftain* and *Seatow 22* had other contractual commitments, and departed the scene on 22 February. However, *Seatow 25* with another 50 t bollard pull, had arrived from Vanuatu, as had *Titirangi* from Auckland. *Keera* was repositioned with *Seatow 25* pulling on the bow and *Titirangi* pushing on the stern, and the ground tackle was tensioned. Ballast was commenced blowing at 0800 for a 1.8 m predicted high water at 1448. However, the vessel appeared to be trapped in mud in the trench she had dug for herself, and was sluggish on a falling tide, so the refloat was suspended at 1700.

**Seventh Attempt**

*Seatow 17* continued taking logs off, assisted throughout by the three helicopters airlifting logs ashore.

On 23 February, ballast was commenced blowing at 0800. The tug arrangements remained, with *Keera* and *Seatow 25* pulling on the bow and *Titirangi* pushing on the stern, and the ground tackle was tensioned. However, by the time the tide had started falling little progress appeared to have been made, and the refloat was again suspended.

**Eighth Attempt Successful**

On 24 February, ballast was commenced blowing at 0830. The tugs took the strain but, soon after, the towline to *Keera* parted. Nevertheless, by 1556 *Jodie F. Millennium* was free and afloat. She was manoeuvred by the tugs to a holding area south of the entrance channel. Drafts were 7.73 m forward and 8.45 m aft, indicating that they had had to lighten the vessel by removing 4100 t of pine logs.

The first logistics delivery to the ship following the refloat was 20 cartons of pizza!

**Delivery**

The vessel was subsequently towed to the safe refuge port of Tauranga, north-west of Gisborne on the Bay of Plenty, where she arrived on 3 March 2002. The remaining cargo of pine logs was discharged, and the vessel prepared for a long tow to Japan for repairs.

On 16 March the re-delivery certificate was signed and, on 19 March, the vessel departed Tauranga under tow. On 31 March 2002, *Jodie F. Millennium* was handed over to a Japanese ocean tug at a rendezvous point in Solomon Islands for delivery to Japan, thus ending United Salvage's responsibility.

**Conclusion**

In summary, salvage jobs are mentally stimulating for all concerned, as the pace can be fast and furious for an extended period. It can be financially rewarding in the end, but often takes a long time to settle; this one took two years!

**Questions**

Question time was lengthy and elicited some further interesting points.

In reply to the first question, about the financial reward, John said that typical awards for salvage claims were of the order of 30–40% of value. In this case, the salved value would be of the order of $18–20 million, with the cargo of logs worth a further $2–3 million, say $22 million total. However, repairs would have cost about $6 million, so the remaining value would be of the order of $16 million, and the reward of the order of $5 million. But that didn't show up for two years, and the show has to keep going until it arrives!

A number of questions were then asked in quick succession:

- Did the vessel have an energy towline? — No; tankers often do.
- What was the gross tonnage of the vessel? — About 17 000; dwt about 25 000 t, with four holds; i.e. a small handysize vessel.
- Bow shackles (in some of the ground tackle) should never be used!
- Why was ballast not commenced pumping at the start of the rising tide? — It was; usually 3–4 h before high water.
- Where did the divers come from? — They were all local divers.
- Why were two of the tugs released to disappear in mod-operation? — They had charter operations for which contracts had been signed, and were due elsewhere.
- It was pleasing to see that the case did not go to arbitration, as that would have greatly reduced the award over a twelve-day operation.

The next comments were from a mariner who grew up in Gisborne, took up a marine engineering apprenticeship and then spent much of his life at sea. When growing up, sailing around Gisborne, he learned to keep a sharp eye on the weather, which could deteriorate very quickly in that area. The port used to export meat, by trans-shipping to vessels in the open roadstead. The port was then extended to take these vessels — and log ships — inside the port.

Helicopters were used to remove logs from the vessel, as they could drop the logs ashore, and more quickly than the barge could do so. The cargo was not jettisoned (thrown overboard) as this would have created its own problems with logs washing up on the beach and being widespread, creating a logisitical problem for collection. The helos could transfer logs quickly, and place them neatly where required.

RIBs with covers were used for the transfer of HFO to HMNZS *Endeavour* because of a MSA directive; it was not the salvor's choice.

Regarding the ability of the Gisborne Port Authority to order the vessel to sea, apparently this is still the subject of vigorous legal argument!

The vote of thanks was proposed, and the "thank you" bottle of wine presented, by Tarran Peh, who said that this was very practical presentation and that he — and the whole audience — had learned a lot. The vote was carried with acclamation.

## Security and Environmental Protection

Rob Madders, Marine Manager for Roll-Royce Australia Services, gave a presentation on *Security and Environmental Protection by Commercially-designed Vessels* to a joint meeting with the IMarEST attended by twenty-one on 12 September at Engineers Australia, Chatswood.

This presentation was similar to *Coastal Protection Vessels for the Containment of Maritime Accidents* presented by David Bricknell and Robert Skarda of Rolls-Royce, UK, at the Pacific 2006 International Maritime Conference in February, but specifically tailored for the Australian scene. The written paper from the Pacific 2006 IMC is reproduced elsewhere in this issue with permission.

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

## Post-damage Ship Structural Strength

Stuart Cannon, Senior Research Scientist in the Maritime Platforms Division of the Defence Science and Technology Organisation, gave a presentation on *Post-damage Ship Structural Strength* to a joint meeting with the IMarEST attended by twenty-four on 10 October at Engineers Australia, Chatswood.

**Introduction**

Stuart began his presentation with an overview of damage survivability, which depends on a number of factors. Commercial vessels typically operate in well-charted waters, close to frequented shipping lanes, and can use weather-routing to avoid the worst of the weather. Naval vessels, on the other hand, may operate in poorly-charted waters, away from other traffic, and may have to perform in the worst of weather and sea states. For naval vessels, survivability also includes susceptibility (the ability to avoid detection, prevent lock-on, provide a decoy and/or destroy incoming weapons) and vulnerability (the ability to minimise damage, control the effects of damage, and maximise recovery). Design for reduced vulnerability can include compartmentation, blast-resistant structures, separation of functions, redundancy, shock hardening, ballistic protection, fire-management and suppression, smoke removal, flooding mitigation/management and crew protection. Stuart then showed a graph on which vulnerability was quantified by the time taken to recover a minimum specified capability.

**Damage Assessment**

The platform damage, assessment process has to consider the overall platform and must, therefore, consider not only the structural side, but also the stability. If the assessment of either the stability or the structure indicates poor reserves, then the ship should be abandoned. However, if both assessments are good, then damage-control measures can be undertaken and the ship can be saved. However, in between the "good" and "poor" assessments lies a whole spectrum, and it may be difficult to determine your location within this spectrum. In this presentation, only the structural aspects were considered.

In order to assess the structural survivability, the crew need to know the extent of the damage, the current sea state, whether the particular mission can be continued (i.e. can the ship remain afloat? can it move? can it fight?), and whether there will be any progressive collapse. DSTO set out to see if they could provide answers to some of these questions in a simple form, usable by those on board.

**Objectives**

The aim was to develop a tool that can be used by the crew to assist with decisions. The tool must be able to take into consideration the residual ultimate strength of a damaged vessel, the operational loading (i.e. with regard to speed, heading and sea area), and the possibility of flooding and progressive collapse.

Ultimate strength of the hull girder can be considered by subjecting the hull to large hogging and sagging bending moments, and considering the response on a plot of moment vs curvature. The plot is linear in the elastic range, goes non-linear (concave down) in the elasto-plastic range, and falls away in the post-collapse range (similar to a simple stress-strain curve).

Residual ultimate strength can be assessed by considering cross sections of the vessel, and then imposing various damage scenarios on each cross section (damage location and size) and calculating the residual strength for each scenario.

**Examples**

Stuart then showed two examples of damage sustained by naval vessels, not directly related to their military roles.

On 12 October 2000, USS *Cole* (DDG 67) sustained damage due to a terrorist attack through an external waterline blast (a RIB packed with explosives) while refuelling at Aden, Yemen, and 17 people lost their lives. Due to the extent of the blast damage, it was decided to use the heavy-lift ship *Blue Marlin* to transport the vessel back to the USA for repairs.

On 7 July 2002, HMS *Nottingham* ran aground on Wolf Rock in the vicinity of Lord Howe Island, resulting in damage to the ship's hull. The vessel suffered internal flooding, and the problem was compounded by the fact that the crew had no way of assessing the extent of the underwater damage (extensive under the transom). The vessel was towed stern-first to Newcastle for temporary repairs, then to Sydney, and loaded onto a heavy-lift ship to transport the vessel back to the UK for full repairs.

**Classification Society Rules**

The major classification societies now have rules for the classification and construction of naval vessels. The rules include residual strength assessments for grounding and for collisions where, for different levels of assessment, various amounts of structure are removed and the residual strength determined.

**Ultimate Strength Assessment**

The residual ultimate strength was determined for the Anzac-class frigates by first doing a finite-element analysis of the overall structure. This then provided the inputs for loads on every section of the vessel. Each section was then analysed and the ultimate strength calculated at each section. This provides a plot of hogging and sagging bending moments to cause first yield and ultimate failure against location along the hull.

Then the damage scenarios are imposed, and the changes in bending moment to cause first yield and ultimate failure at are plotted, showing the changes and the residual ultimate strength envelopes.

**Operational Loads**

Loads imposed on the vessel in operation have a certain probability of occurrence, and an associated magnitude. Generally, the load depends on the ship speed, the heading angle, the sea state (wave size and direction) and the load condition of the ship (e.g. flooding).

Environmental aspects allow a graph to be drawn of a cumulative probability of being a given distance from port, and a cumulative probability of being in a given sea state. A combination of the two allows the derivation of a combined probability of being in a certain sea state for a certain duration.

Limitations on sea loads are based on those for the intact hull. There is a need to consider, in addition to the usual parameters, the mass of entrained water, any change in draft or trim or heel due to damage, and any asymmetric effects.

The bending moments due to operational loadings are then plotted against the ultimate and yield-strength envelopes along the length of the vessel, and any points of close approach noted as being critical for that damage scenario.

This, in turn, can provide a structural capability vs time plot, where the initial damage causes a degradation of capability (which may depend on the ship heading and sea state), but the capability may stabilise at an acceptable level so that abandoning ship is not necessary.

**Future Research Issues**

Issues which have been identified as requiring further research include the effects of entrained water and trim/heel on ship status, the effects of progressive collapse, fracture and heel on the structure, and tools for analysis and crew guidance.

Progressive collapse is an area receiving more attention. The aim is to model the flooding of ships after damage and to predict bulkhead failure caused by sloshing loads. One approach is to use finite-element codes with an embedded smoothed-particle hydrodynamic capability. Smoothed-particle hydrodynamics (SPH) is a mesh-free Lagrangian particle method for modelling fluid flows, in which the system is represented by a set of particles. Each particle possesses individual material properties and moves according to conservation equations (Newton's Second Law). This allows for complex fluid-structure interactions. This can therefore provide the link between structures and damaged stability.

**Conclusion**

In summary, the work of DSTO has demonstrated a way forward for ship structural assessment. However, further research is required to validate what has been done.

**Questions**

Question time elicited some further interesting points.

The intent is, ultimately, to provide those on board with a tool to provide a quick, easy guide so that they can get a gut feeling for what is necessary and/or possible as a result of the damage sustained. It is not feasible to have a full finite-element analysis capability on board, and shore support as a back-up is seen as more useful.

Deterioration of the ship's structure over time (due to corrosion, fatigue, etc.) will affect its residual strength and, hence, its survivability. This can be factored in to the analysis, although it has not been done so far.

It is interesting to note that, while the Armidale-class and Fremantle-class patrol vessels have similar crew numbers, the Armidales are larger, more capable vessels, and so the crew workload has increased.

The damage-control officers from HMAS *Cerberus* talk to DSTO regularly about missions and threat scenarios, discuss the implications of likely damage, and then go and practise suitable damage-control measures on board.

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

*Phil Helmore*

## Queensland

**Queensland Section Committee Meetings**

The Queensland Section Committee met on 8 August and 17 October and at both meetings most discussion concerned the implementation of the Queensland TAFE Ship and Boat Design Courses in Brisbane and on the Gold Coast and the end-of-year Queensland Section Social. It is anticipated that information on the TAFE Courses will be available for the next issue of *The ANA*. With regard to the end-of-year social, present indications are that the function will be held on a Brisbane River cruise, as was the case last year.

Correspondence for the Queensland Section should be sent to Alan Prigg, Hon Secretary/Treasurer, Queensland Section, RINA, PO Box 534, Carina, Queensland 4152, email alan.prigg@qbuild.qld.gov.au.

**STS Design Technologies**

Ross Ballantyne of Sea Transport Solutions (STS) gave a technical presentation on 12 September at the Gold Coast. Ross described some of the design techniques used by STS during their design work.

The technique used by STS to produce the optimum vessel type/size/speed and operation method for commercial transport is focused on the revenue deadweight of the vessel (revenue deadweight is the deadweight which the operators are actually being paid to carry, e.g. trucks, cars and passengers, but not the fuel, ballast, water etc.) A review of proposed capabilities of the vessels, including range, speed, operational costs, capital costs, and sea-state limitations etc. is then undertaken. These capabilities are then broken down to revenue units and compared to the vessel's lightship weight. Comparisons are then made with vessels currently operating in the market, both secondhand and new, which are then graphed to find the most appropriate vessel for the intended operation. This technique is used for every STS client interested in any form of marine operation. It ultimately solves the question "Whose boat is better?" with supporting figures that highlight the optimum solution to make money for the intended operation.

The approach that STS uses in coming up with a better solution is by finding the faults in current vessels and focusing on making the whole operation simpler. The example used was the conventional landing craft, which can often have the following problems:

- Poor head-sea capability due to the bluff bow.
- Poor visibility due to the forward bow ramp.
- Poor stability due to low profile of GZ curve and low freeboard.
- Poor ability with beaching and de-beaching due to suction of forefoot on the sea bed and propellers working inefficiently in reverse.
- Operator discomfort due to noise and vibration of machinery room directly below the wheelhouse, causing fatigue.
- Ballast requirement due to box-shaped hull and propellers required to be immersed, resulting in additional machinery that may require repairs and maintenance.

In comparison, a stern landing craft designed by STS offers:

- Improved sea capabilities and speed due to finer hull and bow shape.
- Good forward vision, due to high forward superstructure which also helps protect the cargo from sea spray.
- A shallow V hull with two side pods, off centre shafts and a beaching-protection aft skeg arrangement that improves de-beaching and propeller efficiency.

- A V-shaped hull which eliminates need for ballast and means less machinery power and thus reduced maintenance and repair.
- The superstructure is away from the engine room
- Cheaper capital cost and lower operational cost

Ship model testing by STS started back in 1986 with bulbous bow developments on catamarans. Various bulb shapes and sizes were tested, including circular, pear-shaped, elliptical, etc. The hulls were also tested without bulbs. The most effective bulb improved calm water speed by 1.5 knots and, furthermore, the motions and accelerations in a sea state were reduced significantly, effectively maintaining the speed compared to conventional mono-hulls and catamarans.

In 1997, STS won an international tender for P&O in India for a 15 m passenger ferry. The design required low accelerations at the LCG (the main component involved with sea-sickness, yet frequency dependent) without the use of external appendages for ride control. An efficient hull was also required. Tests were done with a 1:3 scale model, which proved to be beneficial.

Additional tests were conducted with varying LCB–LCF separations and locations with a 1:10 scale semi-SWATH model at the Australian Maritime College's towing tank. These quantified both the motions and accelerations, and the natural frequencies of the heave and pitch RAOs. The tests correlated well with similar research papers.

Bulb modifications were made and the tests repeated, resulting in pitch-motion reductions of up to 23%. Vertical accelerations at the LCG were reduced by 15% and considerably more at the wheelhouse. Calm-water resistance was also recorded and the modifications still maintained the very low resistance.

Ross concluded that research and development work should be on-going for leading-edge innovations if the Australian marine industry is to survive in the future.

*Brian Robson*

# COMING EVENTS

## NSW Section

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

Tickets are available from Adrian Broadbent on (02) 9262 1424 at $30 per head (cash or cheque payable to RINA NSW Section).

## Pacific 2008 International Maritime Conference

Following the success of the Pacific 2006 International Maritime Conference, preparations are well underway for the next conference in this series, which will be held in Darling Harbour in Sydney from 29 January to 1 February 2008.

The Call for Abstracts was recently released and a copy in PDF format can be downloaded from www.pacific2008imc.com/pdf/Pacific2008_Call_for_Abstracts.pdf . Submissions are to be made via the Conference website and must adhere to the guidelines also available on the Conference website at: www.pacific2008imc.com. The deadline for receipt of abstracts is 3 May 2007. Further information can be obtained from Pacific 2008 IMC Managers, GPO Box 128, (10th Floor, 51 Druitt Street), Sydney NSW 2001, telephone (02) 9265 0700, fax (02) 9267 5443 or email pacific2008imc@tourhosts.com.au.

# CLASSIFICATION SOCIETY NEWS

## Meeting of LR's Australian Technical Committee

The Australian Technical Committee of Lloyd's Register met on 6 October to consider proposed changes to Lloyd's Rules for Ships and Lloyd's Rules for Special Service Craft. Comments from the Australian Technical Committee will be considered, along with comments from other LR Technical Committees around the world, by Lloyd's Technical Committee in London in November, and the changes will be promulgated in 2006.

## DNV Moves Sydney Office

Det Norske Veritas has recently moved offices in North Sydney. The contact details are now as follows:
Level 7, 124 Walker Street, North Sydney NSW 2060, tel: (02) 933 1966, fax: (02) 9929 8792.

*Phil Helmore*

# GENERAL NEWS

## ADI Joins Thales

On Monday 16 October 2006, ADI Limited joined with other fully-owned Thales subsidiaries to become the single organisation of Thales Australia.

ADI Limited was originally bought from the Commonwealth Government by a joint venture of Thales Holdings and Transfield Holdings in 1999. The joining of ADI, Thales Underwater Systems, Thales Air Traffic Management, and Thales Training and Simulation creates an organisation that has 3500 employees and an annual revenue of $900 million. The new organisation is divided into six business groups: Naval, Land, Joint Systems, Defence Services and Aerospace, and Air Systems and Civil.

Chairman of Thales Australia Holdings, Paul McClintock, said that the move would leverage Thales Australia as a globally-competitive business by integrating skills, knowledge and talent both locally and internationally. "To become a more substantive competitor in the reshaped Australian defence industry and compete in the face of fierce global competition, the business needs access to global expertise, technology and supply chains" said Mr McClintock.

"Importantly this will also enhance Australia's defence support capabilities regionally and globally" said Thales Australia's Managing Director, Norman Gray.

Worldwide, Thales employs 60 000 people in 50 countries and generated revenue of $17 billion in 2005 with a record order book of over $34 billion.

The Ship Design and Engineering business, located at Garden Island, will continue to support both naval and commercial customers in Australia and, now, worldwide. "The capabilities and experience of the Ship Design and Engineering group are unique among the Thales organisation, and the joining of ADI with Thales will allow these capabilities to be used worldwide" said Thales Australia, Naval's Manager of Naval Architecture, Mr Peter Swain.

*Peter Swain*


HMAS *Melbourne* at Garden Island during the later stages of her upgrade by Thales Australia. *Melbourne* is the second FFG to undergo the major upgrade to the ship and combat systems to improve the capability of the RAN ships and extend their life well into the next decade. After sea trials, *Melbourne* is expected to be handed back to the RAN by mid 2007. HMAS *Darwin* is expected to begin her upgrade in early 2007 with the last ship, HMAS *Newcastle*, to follow in late 2007
(Photo courtesy Peter Swain)

## Warships to be sunk off Victoria and New South Wales

On 19 October the Minister for Defence, the Hon. Brendan Nelson MP, announced that Victoria is to be given the former RAN guided missile frigate, HMAS *Canberra,* for sinking as a dive wreck. The Commonwealth Government will contribute up to $2.8 million in funding towards the costs of sinking.

The Victorian Government has stated that the preferred location for *Canberra* is south of Barwon Heads on the Bellarine Peninsula.

New South Wales also stands to benefit, despite having been the unsuccessful bidder on this occasion for *Canberra*. The NSW Government will be offered first right to bid for HMAS *Adelaide* when she is decommissioned in late 2007. The NSW Government has indicated that the preferred location for a dive site is the NSW Central Coast.

Tourism projects which have previously used former RAN warships to establish dive wrecks have reported annual revenues ranging from $2.4 million to $23 million flowing into local communities.

## New Catamaran Ferry *Cat Roses*

*Cat Roses* is a 24 m catamaran ferry built by Aluminium Marine at Thornlands in Brisbane. The vessel was designed by Stephen & Gravlev Pty Ltd, also based in Brisbane.

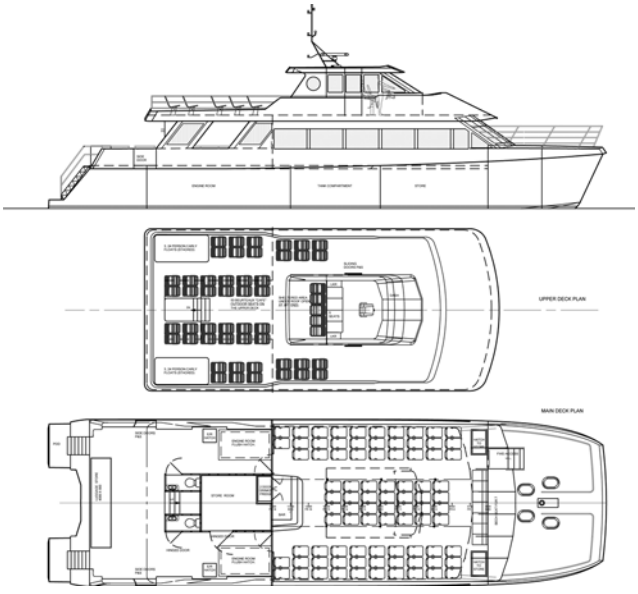
The ferry is to operate in the Seychelles, providing a shuttle-type service between the island of Praslin and the resort island of La Diguea. *Cat Roses* will also provide a feeder service for a larger 35 m passenger ferry, also being built by Aluminium Marine.

The vessel has a cruise speed of 25 kn, which will enable the crossing to be made in just 15 minutes, twice as fast as the current ferries. Seating is provided for 93 passengers in the air-conditioned saloon on the main deck, with additional external seating on the upper deck. A small wheelhouse set in from the bulwarks provides a "walk around" feature for passengers. A large storeroom is also located aft for shipping supplies to the islands with an additional covered baggage store at the transom. Access is provided to the foredeck through a forward door in the saloon front. Large windows on the sides and front of the saloon provide the passengers with excellent visibility.

**Principal Particulars**

| | |
|---|---|
| Length OA | 24.9 m |
| Length WL | 23.6 m |
| Beam | 7.45 m |
| Depth | 2.77 m |
| Fuel | 3800 L |
| Fresh Water | 1000 L |
| Sullage | 1000 L |
| Engines | 2 x Caterpillar C18 183TE02 each 650 kW at 2200 rpm |
| Speed, max. | 29 kn |
| Speed, cruise | 25 kn |
| Class | 1C (150 passengers) |

*James Stephen*



General Arrangement of *Cat Roses*
(Drawing courtesy Stephen & Gravlev)

## Austal Patrol Boats for NSW Water Police

Following their delivery voyage from Fremantle to Sydney via the Great Australian Bight, six 16 m patrol boats began service with the New South Wales Water Police in September.

Austal was able to secure the contract by demonstrating a proven product and by delivering six boats in a little over twelve months from the date of order. Operating primarily as a first response to marine crime, but also in a search and rescue role, these new boats complement seven 16 m and two 22 m patrol boats delivered to the NSW Water Police by Austal in 2000.

**Principal Particulars**

| | |
|---|---|
| Length OA | 16.0 m |
| Beam | 4.87 m |
| Draft | 1.25 m |

**Propulsion**

| | |
|---|---|
| Main engines | 2 x Caterpillar C12, each 492 kW |
| Gearboxes | 2 x Twin Disc Quickshift MGX 5114A |
| Speed, max. | 28 kn |
| Speed, cruise | 20 kn |
| Survey | USL Code Class 2B |

## HMAS *Sirius* Commissioned

The Navy's Underway Replenishment ship, HMAS *Westralia* departed naval service in a ceremony on 16 September at Fleet Base West. The ceremony was held in conjunction with the commissioning of the RAN's newest ship, HMAS *Sirius*.

Maritime Commander Australia, Rear Admiral Davyd Thomas AM CSC RAN, and the Commanding Officer of HMAS *Westralia*, Commander Tim Crawford RAN, and the ship's company of both *Westralia* and *Sirius* took part in a joint decommissioning and commissioning ceremony. Senator Judith Adams representing the Minister for Defence and the Chief of Navy, Vice Admiral Russ Shalders AO CSC RAN, joined family and friends of the ship's company.

"HMAS *Westralia* has provided 17 years of dedicated underway replenishment support to the fleet through provision of fuel, food and stores, thus significantly extending its operational reach and endurance at sea. She has provided sterling service and will be fondly remembered by ship's company, both past and present", said Commander Crawford.

She was the second RAN warship to bear the name *Westralia*, named after the State of Western Australia. *Westralia* saw active service in the Gulf War as part of a multi-national naval force conducting operations in support of the liberation of Kuwait. She has also participated in operations in the Southern Ocean and deployed throughout South East Asia on numerous occasions.

HMAS *Sirius* is the first ship of the RAN to bear the name. She is named after the First Fleet flagship and supply vessel, HMS *Sirius,* which provided logistical support to the new colony of Australia between 1788–90.

*Sirius* will have enhanced aviation facilities with a full flight deck capable of landing all RAN helicopters, including the Sea King replacement, the maritime support helicopter (MRH-90). *Sirius* will be fitted with state-of-the-art equipment ensuring that she is able to fully

integrate with RAN and allied ships. Importantly, she is a double-hulled environmentally-friendly tanker and meets International Maritime Organisation standards and is evidence of the Navy's firm commitment to protection of the environment.


HMAS *Sirius* shortly before completion
Photo courtesy Hugh Hyland)

## Naming Ceremony for Patrol Boats

The eighth and ninth Armidale-class patrol boats were named in a ceremony at the Austal shipyard in Henderson, Western Australia, on 27 August.

The 56 m, all-aluminium monohull vessels were named *Broome* by Mrs Anne Zilko, daughter of ex-crew member Bill Ritchie of the first *Broome* (subsequently a Commander in the RAN), and *Bundaberg* by Dr Jocelyn Pixley, daughter of Lieutenant Commander Neville Pixley RANR, Commanding Officer of the first HMAS *Bundaberg*.

The ceremony was attended by senior figures from the Royal Australian Navy, Department of Defence, Government and industry including The Hon. Christopher Ellison, as representative for the Minister of Defence, Chief of Defence Force, Air Chief Marshal Angus Houston and Chief of Navy, Vice Admiral Russ Shalders.

Speaking at the ceremony, Austal's Executive Chairman, John Rothwell, marked the significance of the occasion and commented on the recent Royal Australian Navy contract announcement:

"Testament to the role and versatility of the patrol boats, Austal's original contract to build 12 Armidale-class patrol boats was recently boosted by an order for an additional two boats."

RADM Trevor Ruting RAN, Head Maritime Systems Division, Department of Defence, reinforced the successful partnership forged between customer and contractor: "A real strength of this project has been the effective teaming of Austal, Defence Maritime Services and the Defence Materiel Organisation to provide the Royal Australian Navy with new patrol boats to a unique Australian design optimised for Australian conditions."

The first HMAS *Broome* was commissioned in Brisbane in 1942. She commenced her career engaged on anti-submarine patrols and escort duties in the North Queensland area, following which she transferred to the north coast of New Guinea were she performed similar work in the Port Moresby and Milne Bay areas. During January 1945 she returned to Australia for refit, followed by further service in New Guinea, after which she proceeded to Darwin where she joined the Royal Australian Navy Survey Group.

The original HMAS *Bundaberg* was named after the Queensland Coral Coastal town. At the completion of her trials in October 1942, HMAS *Bundaberg* was assigned to operational duty as a convoy escort vessel on the east coast of Australia between Melbourne, Sydney and Brisbane. From April to August 1944 she bombarded Japanese positions on Alim Island, took part in landings on Sek Island and gave general support to the campaign which ended with the capture of the Admiralties and the establishment of an Allied base on Manus Island in the Bismarck Archipelago.

Between the latter part of 1944 and mid 1945, *Bundaberg* spent her time on patrol and escort duties in New Guinea. In September 1945 she travelled to Borneo and took part in the recovery of Allied prisoners of war, and was present at Kuching for the official surrender of the Japanese forces.

The new RAN Armidale-class patrol boats
*Broome* and *Bundaberg*
(Photo courtesy Austal Ships)

## Queensland Industry News

**North Queensland**

Tropical Reef Shipyard continues to have a very full order book and is struggling for tradesmen boilermakers at the Cairns-based operations. *Bosset Chief*, a 70 m Steamships' vessel operating on the Fly River was recently completed with over 400 t of new steel. At present the yard is full to capacity with a mixture of commercial and naval work which includes four- and two-year refits for RAN LCH landing craft, HMAS *Brunei* and HMAS *Balikpapan,* including the installation of new Detroit Diesel engines to replace existing Caterpillars, an annual refit for the 88 m cargo vessel *Sepik Coast*, a refit (by side slipping) of *Manasses*, a 40 m landing craft from the US Army base at Kwajalein, an in-water refit for *Castel Braz*, a 76 m purse seiner from Pohnpei, Micronesia, including fitting new exhausts and a Micronesian 35 m patrol boat refit in the floating dock.

Forthcoming refits include *Mauthawmarsach* (a 67 m purse seiner), *Great Bridge* from Kwajalein, *New Island Coast* (a 105 m cargo vessel), *Grete Thresa* (a 67 m fuel tanker from Noumea), *Pacific Discoverer* and *Newcastle Bay*.

AIMTEK (formally NQEA) is progressing the design for up to eight River Runner® 200 MkIIB ultra-low-wash ferries for the London operator, Collins River Enterprises, to substantially expand their current fleet of three ferries previously designed and built by NQEA. NQEA promoted their internationally-successful River Runner® ferry design

to CRE's Thames Clippers some five years ago with the flagship vessel *Hurricane Clipper* capable of carrying up to 220 passengers at 27 knots on a regular commuter service along the Thames. The venture has proven to be extremely successful.

The construction contract awarded to Brisbane Ship Constructions (BSC) for the new craft will substantially increase the frequency of commuter operations as well as service the redeveloped $O_2$ (millennium) Dome entertainment facility. AIMTEK has also licensed BSC to build the new 38 m long ferries. BSC was responsible for building the first eight CityCats which operate on the Brisbane River. The agreement with BSC provides the design and technical support for the AIMTEK-designed craft for construction at their Hemmant works. It is expected that the first four craft will be delivered to enter service at the beginning of July 2007 and the remainder by November 2007. BSC will be using their innovative construction and management skills on the highly-prestigious project and will be hoping for further such projects in close collaboration with the AIMTEK design team. AIMTEK presently provide maintenance management services to CRE on the Thames and plans to expand its London staff and facilities to meet the expanding River Runner® fleet.

Cairns Slipways commercial work is presently quiet; however, regular customers such as Seaswift will have some vessels slipped for their annual refits before the end of the year. Upcoming motor yacht refits will include *Grand Finale*, a 43 m Delta FRP yacht, for repaint and *Cracker Bay*, a 44 m Hardcourt yacht, for stabiliser, propulsion-train gear and paint work. The motor yacht, *Flying Fish,* will be slipped and have stability work completed for conversion to charter operation for an Innisfail owner.

English Engineering recently launched the 45 m *Daintree Ferry* for owner Chris Norman to transport cars, trucks and foot passengers across the Daintree River north of Mossman. Designed by Stewart Marine Design, the cable-driven steel-hull ferry has a capacity of 27 vehicles and was expected to commence operations on 22 October following an overnight changeover with the existing vessel. English Engineering is also expected to commence construction soon of a reef-based moored pontoon for a Malaysia tourist venture.

**Brisbane Region**

Aluminium Marine is progressing the construction of a 35 m passenger ferry for the Seychelles which is due for delivery this year.

Aluminium Boats Australia has won an order for a 24 m passenger ferry to provide a service to the Moreton Bay islands. The ferry will have a capacity of 180 passengers and a top speed of 24 knots. The vessel will be built at the Aluminium Boats Australia facility at Hemmant on the Brisbane River.

New Wave Catamarans are constructing another 24 m dive catamaran which will be a sister ship of the dive catamaran for Port Douglas. An oil-reprocessing catamaran is also under construction.

**Gold Coast**

With Christmas just around the corner, the Gold Coast marine industry is entering its busiest time of year with lots of interest for new builds and refits. The Gold Coast City Marina is busy with various large jobs currently on the go; Marine Engineering Consultants have secured a transom extension on a 30 m aluminium motor yacht, and Blackline Shipping have various refits and new builds nearing completion.

Innovation Power Catamarans have recently released their 52 ft (15.8 m) model. The Innovation 52 has similar attributes to their 65 ft (19.8 m) model, but is more suited to an owner-operator. Their goal was to design a boat that is easy to handle by a couple, has good performance and retains comfortable and spacious accommodations. The tried-and-tested hull shape has been scaled down but retains its good sea-keeping qualities.

Sunrunner Sport Cruisers recently celebrated the construction of their 200th vessel and their 100th 3700-model vessel. The company began operation in 2001 by building its 3700 model. Today the company has grown so that clients now have seven different model sport cruisers to choose from. The 3700 was awarded a Boat of the Year Award in 2002.

Lightwave Yachts, one of Australia's leading catamaran builders, has recently released a four-cabin charter layout for the Sailing Lightwave 38 ft (11.6 m) and Lightwave 40 ft (12.2 m) Power Cat. Whilst any of their four models can, and have, been produced in survey for charter work, this dedicated design is generating a flurry of interest amongst charter companies keen to get or increase the Lightwave models in their fleets. Oceanic Yacht Design completes all survey work for this Gold Coast-based company, who are celebrating 10 years of business. Lightwave Yachts builder, Roger Overell, comments "We get Oceanic Yacht Design involved in the boats built for survey. They have specialised knowledge in multihulls, and a committed, detailed, hands-on approach to their work".

Production boatbuilder Mustang Marin*e* is generating a lot of attention with their newly-released Mustang Performance Vessel, the MPV3000. The MPV division is headed by former Holden Special Vehicles (NZ) boss, Ken Blunt, who has years of customising experience in the auto industry. MPV will be based out of Mustang's Gold Coast facility and will customise and 'up-spec' a range of limited-edition vessels each year, as well as offering customisation options for any of the Mustang Marine range including the soon-to-be-released Sports Flybridge range.

"This division represents another first for Mustang Marine, and a completely new approach for the boating industry," reported Mustang Marine CEO, Paul Scanlon. Mustang Marin*e* has also announced its entry into the Sports Fishing category through a joint-venture arrangement with one of New Zealand's most respected names, Oliver Marine. The agreement combines Oliver's wealth of flybridge experience and R&D with Mustang's manufacturing, marketing, and distribution capabilities. Built at Mustang's Gold Coast facility, the new Mustang Sports Fishing range will initially be developed to include a 37 ft (11.2 m) and 41 ft (12.4 m) offering, with the first boats expected to roll off the production line in November. Other models are also in development and will be released throughout 2007

*Brian Robson*

## New Incat Delivery

Incat recently delivered a new 98-m wave-piercing catamaran to one of Spain's largest shipping companies, Acciona Trasmediterránea.

*Milenium Tres* is the sixth Incat high-speed catamaran to join an Acciona Trasmediterránea fleet which already includes the 96 m *Milenium* and the 98 m *Milenium Dos,* both of which have been operating successfully on the Spanish mainland–Balearic Islands links since 2000 and 2003 respectively, and the 96 m *Alborán* on the Gibraltar Strait's busy Algeciras–Ceuta crossing. In addition, this summer saw Incat's K-class catamaran, *Incat K3,* in operation on the new route from Alicante to Palma and Ibiza.

Under the command of Captain Carlos Duclos, the new vessel left Hobart on 25 September at the start of her 12 000 n mile delivery voyage to Spain. She was expected to arrive at Melilla during the second week of October before entering service from there to Almeria and Malaga.

Incat Chairman, Robert Clifford, said Acciona Trasmediterránea's return for another high-speed craft is confirmation of Incat's determination to build on a history of selling multiple numbers of vessels to a growing list of customers.

"The contract is an endorsement of the excellent business relationship between our two companies, both through the past deliveries of wave-piercing catamarans and also the superior performance they have displayed against other high-speed craft in the region," Mr Clifford said.

With capacity for up to 900 persons and 267 cars at speeds of approximately 40 knots, *Milenium Tres* is the twelfth vessel in Incat's highly-successful 96/98 m range and brings to sixteen the number of Incat vessels operating in Southern European waters.

**Accommodation**

Like her Incat sister ships in the Acciona Trasmediterránea fleet, the passenger spaces on *Milenium Tres* are located on one deck, with three distinctive lounge areas along its length, each featuring its own style of seating, colour scheme and facilities. The interiors are, however, far from identical; *Milenium Tres* boasting many improvements for ensuring passengers benefit from the very latest contemporary designs.

A new feature introduced on board *Milenium Tres* is the fully enclosed port and starboard side aft staircases leading car passengers from the vehicle deck direct to the vessel's aft cabin. On previous 98 m vessels, these staircases have been external to the accommodation, and this design modification is typical of enhancements aimed at further improving the travelling experience for passengers. The staircases each boast impressive views over the stern through tinted windows, and are tastefully finished with Ayrlite Craquelle (off white) composite panels and Amtico floor coverings.

The aft cabin is predominately a spacious business-class lounge containing a mix of comfortable Beurteaux Ocean Tub seats positioned around tables, and Beurteaux Ocean Club reclining seats. Blues, yellows, reds and greys are the predominant seating colours, all of which are finished in wool fabric upholstery with leather trim. The lounge has its own dedicated bar, with stylish glass-topped counters,

which provide facilities to serve a wide variety of food and beverages. Large windows face onto the aft observation deck from where passengers have a spectacular view of the water jets in operation.

Immediately forward of the business-class lounge and located on the port and starboard side of the main aft amenity block, which contains male and female toilets, are further lounge areas each containing 41 recliner seats.

A pivotal element in the light and pleasing colour scheme of the vessel is the Axminster carpet, made by Brintons Carpets. The dark-blue carpet features splashes of red, light blues and aqua in alternating sail motifs, and this lively design is used in all seating areas throughout the vessel with the exception of the business-class lounge where the colour is a more subdued grey.

Complementing the carpets and continuing the theme of brightness, the interiors throughout *Milenium Tres* are finished with lightweight yet stylish Ayrlite laminated composite panels. These panels assist in the all-important reduction of vessel weight which, in turn, helps towards increasing speed, reducing fuel consumption, increasing range and payload, and lowering the vessel's centre of gravity. Typically some 10 to 20 t of displacement can be saved in a 98 m vessel through the use of these panels compared with conventional materials.

The midships lounge is the hub for many onboard activities and is also where foot passengers join the vessel by way of shell doors, port and starboard. The central square, containing 48 Ocean Tub seats set in clusters around tables, is surrounded by a gift shop and a cafeteria, while outboard of the Amtico mahogany, light cherry and wild cherry hard-flooring passageways leading forward and aft, are two lounges each containing 168 Ocean Tourist High-back reclining seats.

In the cafeteria, the servery counter is finished with a curved decorative front while work areas are stainless steel laminated onto a lightweight Ayrlite honeycomb core. Behind the servery the food preparation area is fitted with stainless steel worktops and shelving, two refrigerators, one freezer and two microwave ovens.

The shop, opening onto the midships lounge, with large expanses of glass, is arranged to provide a range of souvenirs, newspapers, books and magazines. Passengers entering the shop cannot fail to be impressed by a large 'sails and compass' motif inlaid into the Amtico floor covering, its finish adding to the elegance of this central lounge.

Undoubtedly one of the most-striking features of the central square is the perforated maritime blue Dampa deckhead panelling. Also seen in the central area of the business-class lounge, the effect in the midships lounge is made more impressive through the additional use of silver mirror tiles across the square. Outboard of these central areas, Luxalon polar white panelling is used.

Throughout the vessel, colour LCD flat screens enable seated passengers to view safety messages, DVD/video programs, and input from the electronic chart system.

Just forward of the shop area in the forward cabin is an amenities block which not only contains male and female passenger toilets plus a unisex disability toilet/baby changing area, but also the crew room and entry to the next deck housing the split-level electronics room and wheelhouse.

The fully-equipped crew mess has seating for six crew members on comfortable bench couches positioned around two tables. In addition to a work station and crew lockers, an LCD television, small refrigerator, coffee maker, and microwave oven are also provided.

The wheelhouse onboard *Milenium Tres* provides 360° visibility for the officers over the top of the aerodynamic superstructure, while an aft-facing docking console and


*Milenium Tres* on trials
(Photo by Richard Bennett courtesy Incat)

CCTV monitors negate the need for bridge wings with their associated windage and weight. Consistent with all Incat vessels, the control station is fitted with the latest in electronic, navigation and communication equipment to comply with the High Speed Craft Code. There are three forward-facing adjustable seats around the centre line, the Captain sitting in the centre, with the Navigator to starboard and the Chief Engineer to port.

The Forward Lounge on *Milenium Tres* provides a panoramic 300º view of the horizon via sweeping tinted windows which are equipped with a washing system ensuring that the windows remain clean during a voyage and valuable operator/crew time can be spent on ship's maintenance rather than cleaning windows.

The area features a fully-equipped bar with facilities to serve a wide variety of food and beverages. Outboard of the passenger walkways are two comfortable lounges where passengers may relax in Ocean Tourist High-back reclining seats, surrounded by panoramic windows again affording excellent sea views. Raised lounge areas immediately forward enable passengers to relax in Ocean Tub seating, arranged around tables, while taking in the vast and spectacular views over the ship's bows.

High-standard outfit in *Milenium Tres*
(Photo courtesy Incat)

The vehicle deck on board *Milenium Tres* offers freight space for 380 truck lane metres at 3.1 m wide x 4.35 m clear height. The fitting of nine hoistable mezzanine vehicle decks gives the operator the flexibility to carry up to 267 cars, or 12 freight trailers with 180 cars, or 24 road-freight trailers with 85 cars while offering the headroom demanded by freight vehicles when raised. Suitable for heavy road transport vehicles, the main vehicle deck also benefits from unrestricted height for 6 metres and an unobstructed width of 18 metres at the stern. Clear lane markings are painted on the deck to ensure fast vehicle loading and unloading via two articulated stern-loading ramps.

Engines from MAN B&W's new RK280 range, considered the most powerful and fuel efficient 1000 rpm diesel engine in the world, have been selected for *Milenium Tres*. Four 16RK280 engines, each rated at a minimum of 7200 kW at 1000 rpm MCR, offer a high power-to-weight ratio with a specific fuel consumption of less than 190 g/kWh.

The engines each drive a transom-mounted steerable Wärtsilä-Lips 120E water jet via four ZF 53000 NRH gearboxes. All four waterjets are configured for steering and reversing, while an independent hydraulic system in each hull covers the steering and reversing functions. Manoeuvring and directional control is enhanced through the use of retractable trim tabs which maximise moment force from water jet side/reverse thrust and optimisation of force/moment positioning.

Four Caterpillar 3406B 230 kW generators are fitted, each being rated with a 10% for one hour overload capacity. The generators are arranged for automatic startup and paralleling, the automation considering one unit maintained as a standby set.

Further improving the 98 m catamaran's already excellent seakeeping qualities is the Maritime Dynamics/Incat Ride Control System, consisting of transom-mounted trim tabs and a retractable T-foil. These, combined with Incat's unique hullform featuring long outer bows, fuller midship sections, stern skeglets and centre bow clearances, means motion sickness incidence has been reduced by up to 40% in higher sea states by reducing pitch, roll and heave, which are the major contributors to passenger discomfort.

As always, safety is paramount and *Milenium Tres* is equipped with four Liferaft Systems Australia Marine Evacuation Stations, two port and two starboard. Each MES serves a total of 200 persons. A total of ten 100-person rafts are fitted. Two SOLAS inflatable rescue boats, each with 22 kW motors, are provided for launch and recovery operations.

Hobart-based company, Colbeck and Gunton, supply the lightweight structural fire protection system aboard *Milenium Tres,* including fire doors and dampers. To protect all moderate and high risk spaces, the 'Rapid Access' (deckhead) and 'Lightweight' (bulkhead) fire-protection system meets all the demands for lighter weight and faster installation/removal for this type of craft. An addressable fire-detection system, CCTV cameras, zoned fire-sprinkler systems and hydrants protect engine rooms, vehicle decks and passenger areas.

**Principal Particulars**

| | |
|---|---|
| Length OA | 97.22 m |
| Length WL | 92.00 m |
| Beam, extreme | 26.60 m |
| Beam, hulls | 4.5 m |
| Draught, loaded | 3.43 m |

**Propulsion**

| | |
|---|---|
| Main Engines | 4 x MAN B&W 16RK280 each<br>7200 kW at 1000 rpm MCR at 32/45º C |
| Water Jets | 4 x Lips 120E waterjets configured for steering and reversing |
| Transmission | 4 x ZF 53000 NRH gearboxes |
| Alternators | 4 x Caterpillar 3406B, each 230 kW |
| Speed, max | 48 kn at 100% MCR |
| Ride Control | Maritime Dynamics active system |

**Capacities**

| | |
|---|---|
| Deadweight | 725 t approx |
| Persons | Up to 900 |
| Vehicle deck | 267 cars or 380 truck lane m plus 85 cars, or a combination of both |

| | |
|---|---|
| Axle loads | Transom to Frame 49: maximum 12 t per dual tyre/single axle group or axle group loads<br>Forward of Frame 49: Ramp 2 t per single tyre/single axle group<br>Ramps B, C and Mezzanine Decks: 0.8 t per axle |

**Tankage**

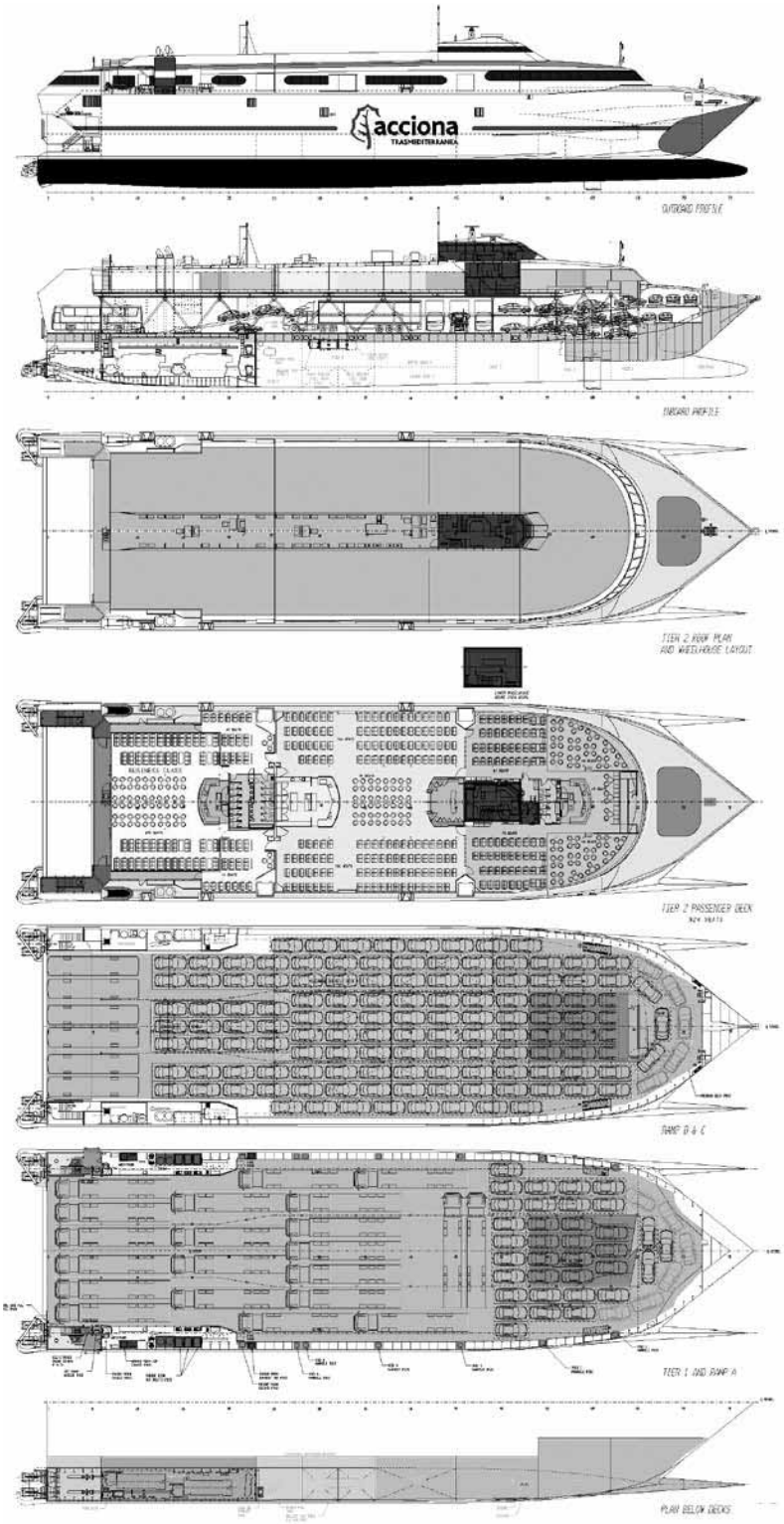
| | |
|---|---|
| Fuel Oil | 190 000 L (plus 420 400 L in long-range tanks for delivery voyage) |
| Fresh Water | 5 000 L |
| Sewage | 5 000 L |
| Lube Oil | 2 x 470 L |

**Certification**

Classification DNV ✠ 1A1 HSLC R1
Car Ferry "B" EO Certificate

DNV Speed/Wave Height Parameters

50 knots: 0.0 – 2.0 SWH
45 knots: 2.0 – 2.5 SWH
40 knots: 2.5 – 3.0 SWH
35 knots: 3.5 – 4.0 SWH
32 knots: 4.0 – 4.5 SWH
30 knots: 4.5 – 5.0 SWH
Seek Shelter 5.0 + SWH




General Arrangement of *Milenium Tres*
(Drawing Courtesy Incat)

## Refit for *Vampire*

The Australian National Maritime Museum's biggest exhibit, the ex-RAN destroyer, *Vampire*, crossed the harbour to Garden Island on 18 October for a major refit. The old warrior, built at Cockatoo Island in Sydney in 1959 and decommissioned in 1986, was towed to the Captain Cook Dry Dock, Garden Island, where she is undergoing the largest works program since she came to the museum in 1991.

More than one million people have climbed aboard and explored *Vampire* at the museum, exploring her gun bays, works spaces and crew quarters.

The refit will include structural repairs and maintenance as well as high-pressure cleaning of the ship's bottom plating and bilges.

*Vampire* will also receive a fresh coat of paint from truck to keel with members of the *Vampire* Association (former crew members) assisting with the work.

The ship is expected to return to the museum on 28 November 2006.

*Vampire* in dock at Garden Island
(Photo courtesy Peter Swain)

## Award for Sydney Heritage Fleet Volunteers

Most 75-year olds could think of better things to do than climb to the top of a ship's mainmast, but at the Sydney Heritage Fleet it happens every week.

A national and state winner in the 2006 NAB Volunteer Awards in the Tourism, Sport and Recreation category, the Sydney Heritage Fleet is a not-for-profit organisation devoted to preserving Australia's proud maritime history.

The Fleet's 600-plus volunteers restore vessels, small boats and engines, staff the maritime history library, assist in the office and crew the eight operating vessels available for public tours and cruises.

Hugh Lander, the Fleet's Development Manager, said volunteers had donated over 126 000 hours during the 2005–2006 financial year — and that was just the hours they could count.

"If you calculate the work at only $10 per hour, that's over one-and-a-quarter million dollars of time our volunteers have given us in just one year" he said.

Mr Lander said the fleet had a dedicated Volunteer Services group to look after the welfare, interests and safety of volunteers.

A SHF volunteer at work on *John Oxley*
(Photo John Jeremy)

"We know that if we don't care for our volunteers, we won't have them. Part of that is acknowledging their contribution, so I simply can't tell you how much winning this national NAB Volunteer Award will mean to our volunteers."

Mr Lander said many people falsely believed that Sydney Heritage Fleet was part of the Australian National Maritime Museum and didn't realise it was a volunteer organisation which needed support.

"We're always trying to raise funds, so the $10 000 prize money will be greatly appreciated. We're thinking about using it to upgrade some of our Volunteer Services equipment. That way we'll be helping every single one of our volunteers."


Considerable progress has been made replating the hull of *John Oxley* at the SHF shipyard in Rozelle Bay, Sydney
(Photo John Jeremy)

## Quality Motor Yacht from Incat Crowther

Incat Crowther have provided details of the high-speed catamaran motor yacht, *Seafaris,* recently completed to their design. Commissioned to provide high end cruise charters in the remote northern waters of Australia, the vessel is capable of accommodating 10 guests in luxurious cabins, cruising at speeds up to 25 knots.

Incat Crowther's expertise in the design of lightweight aluminium structures and fuel-efficient catamaran hullforms was utilised to provide the basic platform for the development of this spacious yacht. The catamaran hull form, still in its infancy in the recreational vessel market, has long proven its abilities to commercial operators around the world. They have been able to take advantage of the economic benefits whcih catamarans provide in terms of fuel efficiency over monohull vessels. In addition, the catamarans are able to

provide the operators with large stable platforms.

The hull is a proven form providing very good fuel efficiency. The hull has also been designed with high wet-deck clearance and fine angle of entry which contribute to the excellent seakeeping characteristics of *Seafaris*.

The main accommodation decks have fully utilised the catamaran's width, providing large spacious cabins and communal spaces. The main deck features a large aft deck incorporating a tender-docking platform which can be lowered and used as a swimming platform, or raised and used to provide a huge aft deck entertainment area. A toy-storage room and day toilet are readily available to the aft deck along with engine access rooms. Double doors lead to the main accommodation deck. A cinema lounge with the latest flat-screen and cinema-quality sound technology is located to port, while the starboard side has a secluded library, and an hourglass-shaped central passageway leads forward towards the owner's cabin. Four guest suites provide walk-around double- or twin-guest accommodation. Each has its own ensuite, lounge, robe and desk facilities. A small gymnasium forward is positioned close to the large owner's suite which incorporates a king-size bed, lounge, robes and a writing desk. The spacious double ensuite also incorporates a spa bath.

The upper deck is the main entertaining area of the vessel. This spacious saloon features a kidney-shaped formal dining table for 11 guests with outboard views through floor-to-ceiling windows. A handcrafted leather lounge is positioned on the port side opposite a full cocktail bar with seating for five. The real feature of the main saloon is the fine joinery which is world class and the exquisite marine-life artwork which is intuitively arranged to define the separate areas. The main saloon leads to the aft deck which is dominated by a teppenyaki bar with seating for ten. Padded external seating surrounds the aft deck. A Portuguese wheelhouse is located forward on this deck and has three helm seats with excellent visibility through vertical windows for the operating crew. A raised guest lounge is located behind the helm seats, allowing excellent visibility of the operating panels. There is direct access from the wheelhouse to the foredeck for vessel operations. A forward-facing lounge is also built into the structure for guests to enjoy that wind-in-the-hair feeling as the vessel plies the tropical waters of northern Australia.

The flybridge is where *Seafaris* comes into its own in the entertainment stakes. The deck area up there is huge, and is dominated by the outdoor spa. A barbeque area is located under the targa wing, providing sun shelter for those hot steamy days in the tropical north. A large open sun deck is located aft. The vessel's second tender is stored on the port side.

The vessel is operated by a crew of ten. The majority of the crew is accommodated in the hulls, with each space having its own wash and toilet facilities. One hull contains the crew mess while the vessel's laundry is located in the other hull. Accommodation for the Captain and Purser are located behind the wheelhouse, again each with their own private facilities.

The vessel is powered by two Caterpillar 3512B engines turning out 1678 kW each and driving five-bladed propellers through Twin Disc reverse-reduction gearboxes, allowing the vessel to achieve top speeds of approximately 25 knots. Relocation speeds would be approximately 12 knots where the vessel can range some 2000 n miles. Cruising at these low speeds, the vessel is very quiet, with particular attention having been paid to noise and vibration in the early design stages. At full speed, noise values on the main deck are a very respectable 65 dB.

**Principal Particulars**

| | |
|---|---|
| Length OA | 41.1 m |
| Length WL | 34.6 m |
| Beam | 11.0 m |
| Draft (approx) | 2 m |

**Passengers**

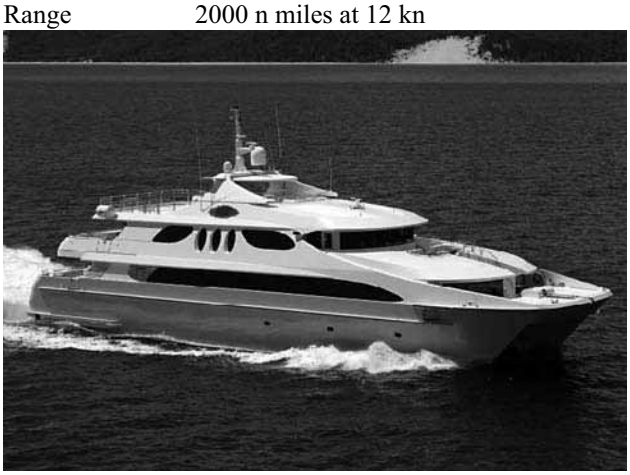
| | |
|---|---|
| Guests | 10 |
| Crew | 10 |

**Capacities**

| | |
|---|---|
| Fuel capacity | 30 000 L |
| Fresh water capacity | 4 800 L |
| Deadweight | 37 t |

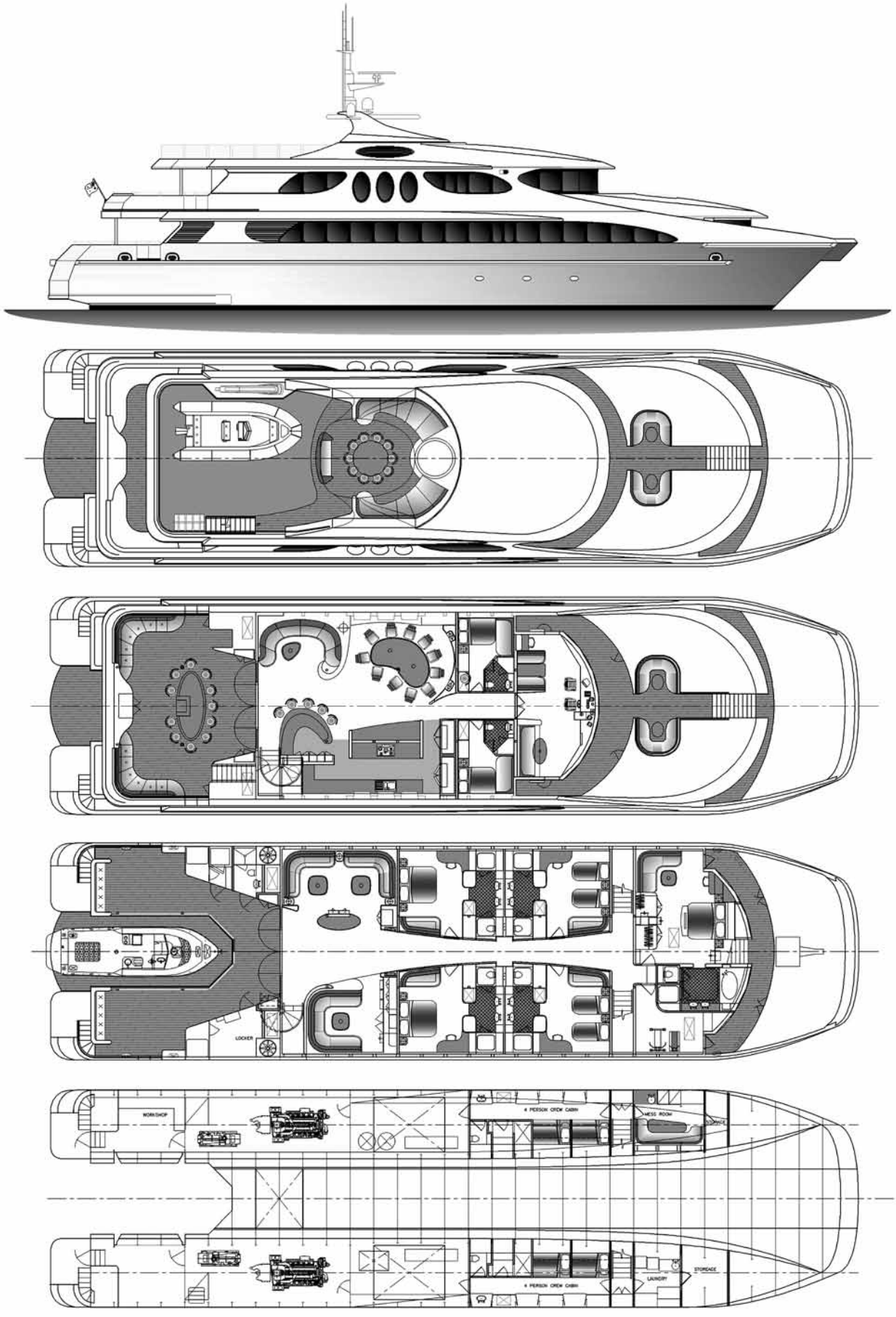
**Propulsion**

| | |
|---|---|
| Engines | 2 x Caterpillar 3512B<br>each 1678 kW at 1925 rpm |
| Gearboxes | 2 x ZF |
| Speed | 25 kn |
| Range | 2000 n miles at 12 kn |



*Seafaris*
(Photo courtesy Incat Crowther)

The wheelhouse in *Seafaris*
(Photo courtesy Incat Crowther)




The General Arrangement of *Seafaris*
(Drawing courtesy Incat Crowther)

## New South Wales Industry News

### Kamira Holdings

Three 15 m patrol vessels designed by Kamira Holdings and built by NGV Tech at their Sijangkang yard (just south of Port Klang) in Malaysia for a Bahrain company were launched early in November. These vessels were reported in the May issue of *The ANA*.

Principal particulars of the vessels are as follows:

| | |
|---|---|
| Length OA | 15.01 m |
| Length WL | 13.40 m |
| Beam | 4.00 m |
| Draught | 0.85 m |
| Displacement | 19.3 t loaded |
| Engines | 2 × Caterpillar C18, each 747 kW |
| Gearboxes | 2 × ZF 550 with 1.262:1 RR |
| Water Jets | 2 × Doen DJ170 Mk2 |
| Genset | 1 × 20 kVA |
| Fuel | 3600 L |
| Water | 200 L |
| Speed | 43 kn at full load |
| Class | Bureau Veritas |

Two 12 m pilot vessels designed by Kamira Holdings and built by Vigormax Sdn Bhd are due to be launched in late November. Vigormax is located in Johor Bahru and builds fibreglass boats for Straits Perkasa Services Sdn Bhd, which is owned by the same group. They also own a tug operations company and operate tugs, ferries, pilot boats and mooring boats at four ports.

These new pilot vessels will go into service in Westport, Malaysia, bringing the total of Kamira pilot vessels to 12 across the four ports. The vessels are designed and constructed for local conditions, so they don't look like your North Sea "go anywhere" pilot boat. Operating hours per annum is up around 3000, so they're well-used.

Of the 12 boats, five have Doen waterjets, two are single screw (single 235 kW engine giving 22 kn) and five are twin screw. They are the most fuel-efficient pilot boats in the region, which is one of the reasons why the company has been so successful. The company has been approached to expand into other ports, but will only do so when they can properly build up the manpower and support structure (all boats are supplied on a wet-charter basis).

The Volvo D7 engine is proving to be very popular and very reliable, with several hundred in service across Malaysia and Indonesia. This engine is a true commercial-duty engine built by Deutz and re-badged. Volvo has completely overhauled its engine range and has replaced all of its lightly-built, light-duty engines. The engine is also keenly priced.

Another engine brand we've had success with in Malaysia is Daewoo. The Daewoo range is based on either Isuzu or MAN engines, with the larger Daewoo engines looking like MAN copies. They have proven to be very reliable commercial engines with reasonably-priced spares and a low purchase price.

Principal particulars of the vessels are as follows:

| | |
|---|---|
| Length OA | 12.2 m |
| Length WL | 11.1 m |
| Beam | 3.6 m |
| Engines | 2 × Volvo D7C-TA<br>each 195 kW at 2300 rpm<br>(but varies across the fleet) |
| Gearboxes | 2 × ZF 280A |
| Speed | 28 kn maximum<br>25 kn operation |
| Air conditioning | Engine-driven |
| Construction | Solid GRP hull<br>Balsa sandwich GRP deck and superstructure |

*Greg Cox*

12 m Pilot Vessels by Kamira Holdings
(Photo courtesy Kamira)

### Lightning Naval Architecture

The ro-ro passenger ferry MS *King of Scandinavia,* owned by Danish ferry operator DFDS, is currently approved to carry 1620 passengers together with their vehicles and a number of road trailers. To enable DFDS to maximize freight capacity, Lightning Naval Architecture has created a computational ship model and has carried out damage-stability calculations to the Stockholm Agreement requirements. This will allow the vessel to operate at a deeper subdivision draft carrying additional road trailers but with a lower (800) passenger capacity.

For Interislander Toll NZ, LNA is carrying out a review of ship survivability together with evacuation analyses. Interislander operates two passenger rail ferries and one passenger ro-ro ferry on the sometimes-treacherous Cook Strait, where wave heights of 8 m are not uncommon. The conditions in the Strait are particularly bad when a southerly sweeps up the east coast of the South Island. The aim of the project is to balance ship survivability times with evacuation times and provide the operators with Go/No-go signals for a range of sea conditions and passenger/vehicle loadings. The task involves computational modelling, onboard measurements and subsequent analyses.

For *Spirit of Tasmania I* and *II*, LNA is producing design drawings and calculations to approval stage for the covering of the aft open vehicle deck with a light roofing structure. This will enable the protection of valuable timber cargoes carried from Tasmania to the mainland. Taylor Bros of Hobart will carry out the construction work.

*Jennifer Knox*

### EMP Composites

EMP Composites has recently relocated offices from Belrose to Warriewood in Sydney. The new office and address are

shown on the company website at http://empcomposites.com.

EMP is in the process of setting up a composites testing and evaluation facility at the new offices. This will allow EMP to verify process variables, such as permeability of laminates during the vacuum-infusion process (used in flow simulation modelling prior to "shooting" a real boat by resin infusion), as well as assisting with building EMP's proprietary composite materials database. The new laboratory will also be used for training, demonstrations, quality assurance and composites education.

These developments form a key extension of EMP's full service capability from CATIA V5 modelling, through finite element analysis, flow modelling and full drawing/documentation to classification society requirements.

EMP is currently working on marine composites projects for Incat Crowther, Barrabay Boats, Northshore Yachts, North South Yachting and Hart Marine, amongst others.

*David Lyons*

## Incat Crowther

The latest creation from the well-established design-and-build team of Incat Crowther and Richardson Devine Marine was successfully launched and trialled on Tasmania's Derwent River in mid August. The 23 m catamaran *Luminosa* is set to join the fleet of vessels operated by Real Journeys, in New Zealand's southern wilderness region.

Following on from the successful design of the 30 m catamaran *Patea Explorer* for New Zealand operator Real Journeys, this new vessel will operate on Lake Te Anau in the rugged fiordland district. The vessel undertook a unique delivery voyage, which included a trans-Tasman voyage followed by a road trip high into the magnificent New Zealand alps.

The 23 m vessel will operate from Te Anau to the beautiful Glow-worm Caves, a journey of approx 25 mins at 25 kn.

The vessel features a main deck with 95 seats inside a spacious open-plan cabin, incorporating a kiosk as well as toilet facilities. There are two main boarding positions, port and starboard, at amidships. Passenger access around the vessel is very good, with wide access doors to both the foredeck and aft deck. A sheltered staircase leads to the upper observation deck where passengers can gain all-round visibility for photo opportunities.

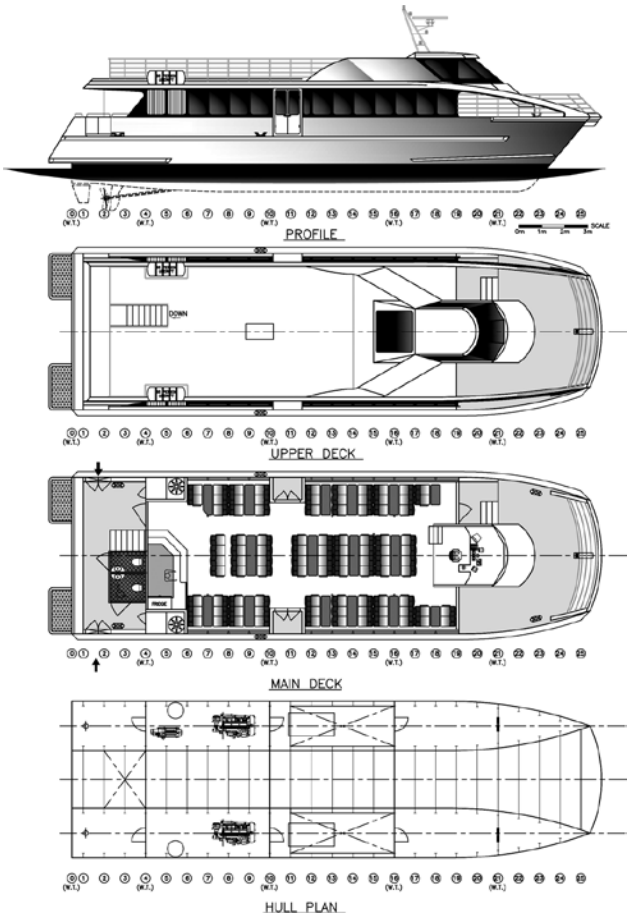
The vessel is powered by twin Caterpillar C18 diesel engines, each producing 533 kW at 2100 rpm, giving the vessel a top speed of 28 kn in the full-load condition.

This vessel is the 16th Incat Crowther vessel to be built by Richardson Devine Marine and is the first vessel to be fully designed under the Incat Crowther banner following the successful merger of the two companies. Currently there are ten Incat Crowther-designed vessels under construction around the world ranging in size from 22 m to 52 m in length.



Principal particulars of the vessel are as follows:

| | |
|---|---|
| Length OA | 23.00 m |
| Length WL | 20.71 m |
| Beam OA | 6.80 m |
| Draft (prop) | 1.70 m |
| Draft (hull) | 1.11 m |
| Passengers | 95 (internal, main deck) |
| Crew | 8 |
| Fuel | 2 × 2 000 L day tanks |
| | 2 × 4 000 L long-range tanks |
| Fresh water | 2 × 400 L |
| Sullage | 1 × 1290 L |
| Deadweight | 11.59 t (excl. long range tanks) |
| Engines | 2 × Caterpillar C18 |
| | each 533 kW @ 2100 rpm |
| Gearbox | 2 × Twin Disc MG 5135 |
| Speed | 28.0 kn |
| Construction | Aluminium |
| Survey | New Zealand MSA/MAST 1C |




General Arrangement of *Luminosa* by Incat Crowther

(Drawing courtesy Incat Crowther)


*Luminosa* Alongside

(Photo courtesy Incat Crowther)

Main Cabin on *Luminosa*
(Photo courtesy Incat Crowther)

Honduras-based operator, Safeway Maritime Transportation Co., has just taken delivery of its first Incat Crowther catamaran ferry, *Galaxy Wave*, for operation on the north coast of Honduras between the mainland city of La Ceiba and Isla de Roatán in the Caribbean Sea.

The vessel is a 46 m high-speed catamaran ferry capable of carrying 460 passengers at a speed of 36 kn. The main cabin contains seating for 237 passengers seated in rows. A simple kiosk area is located aft, along with toilet facilities and a large luggage room. A centrally-located boarding station provides quick access to all parts of the vessel, allowing the vessel to load and unload efficiently. The mid-deck first-class cabin has seating for 60 passengers primarily seated in rows. This cabin also has its own kiosk and toilet facilities. In addition, there is a small VIP cabin for 8 passengers with access from the wheelhouse. An outdoor seating area for 150 passengers is fitted aft of the mid-deck cabin and is protected from the elements by enclosed sides. The vessel's interior has been especially developed to minimise the effects of the tropical environment in which the vessel operates by utilising hard moisture-resistant surfaces.

The vessel is powered by four Caterpillar 3512B main engines, each producing 1342 kW brake power, coupled to Hamilton HM651 waterjets.

The vessel was built by Louisiana-based shipbuilder, Gulf Craft Inc. This is the third high-speed vessel that has been built by Gulf Craft to an Incat Crowther design in the past two years, and has now helped to establish a strong bond between the two organisations. Gulf Craft are now in the early stages of building another large high-speed vessel for service in the Gulf of Mexico.

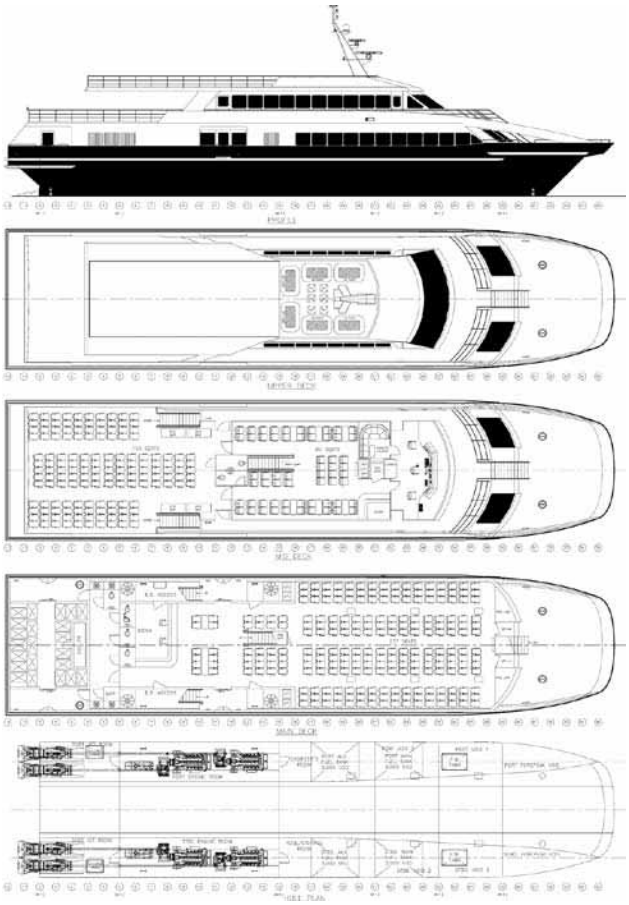
Safeway Maritime Transportation Co. provide two round trips per day between the mainland and Isla de Roatán. The Incat Crowther design was specifically developed with a combination of higher-than-normal freeboard and an interceptor-based MDI ride-control system to provide a very comfortable ride over the 1¼ hour journey.

*Galaxy Wave* represents the 233rd high-speed catamaran designed by Incat Crowther and the 21st design in the 40–60 m range.

Principal particulars of the vessel are as follows:

| | |
|---|---|
| Length OA | 46.30 m |
| Length WL | 38.60 m |
| Beam | 10.36 m |
| Draft (hull) | 1.70 m |
| Passengers | 460 |
| Deadweight | 64.5 t |
| Fuel | 22 712 L |
| Fresh water | 4 164 L |
| Main engines | 4 × Caterpillar 3512B each 1342 kW |
| Propulsion | Hamilton HM651 waterjets |
| Speed | 36 kn |
| Construction | Marine-grade aluminium |
| Survey | None; designed and built using DNV and USCG requirements |

*Ben Hercus*



General Arrangement of *Galaxy Wave* by Incat Crowther

(Drawing courtesy Incat Crowther)

*Galaxy Wave* Alongside

(Photo courtesy Incat Crowther)

Main Cabin on *Galaxy Wave*

(Photo courtesy Incat Crowther)

First-Class Cabin on *Galaxy Wave*
(Photo courtesy Incat Crowther)

## Cruising

After the usual quiet winter period, with *Pacific Sun* the only regular visitor on 7–14 day voyages, the new cruise season has started to pick up with visits to Sydney by *The World* in September, and *Statendam* and *Seven Seas Mariner* in November.

*Phil Helmore*

*The World*, turning. In order to give views of the Opera House to residents on both sides of the ship, which comprises privately-owned apartments, *The World* turned to berth the other-side-to during her visit to Sydney. The operation was completed quickly without the aid of tugs
(Photo John Jeremy)

## Busy Start for One2three

One2three Naval Architects, a new Sydney-based design studio established just 12 months ago, has just launched their first vessel, and has another three vessels due for launch in November. Of interest is the diversity of vessels under design, including a number of monohulls.

**22 m Catamaran *Ocean Discovery***

Pacific Whale Foundation, well known for its whale watching and marine-research activities in Hawaii, has taken delivery of an Island Boats built, One2three designed, 22 m catamaran. *Ocean Discovery* was constructed in aluminium at USA-based Island Boats' shipyard to a tight schedule, with an October 2006 delivery matching the return of humpback whales to Maui from their summer-feeding grounds near Alaska.

Pacific Whale Foundation is a non-profit organisation and operates a fleet of six catamarans from Lahaina and Maalaea, Maui, offering a range of whale/dolphin watching, snorkel/picnic cruises and sunset dinner cruises.

**Hull**

Designed by One2three Naval Architects in Sydney, *Ocean Discovery* is built to USCG Category T requirements, with structure designed to DNV classification society standards. A robust hull structure was required for ocean-going operations, and significant portions of the hull plating have been increased by a plate size over that required by the rule-based formulas at the owner's request.

All aluminium structure was 3D modeled in ShipConstructor software and automatically nested, ensuring accuracy and fairness of the hull and reduced fabrication manhours. A tunnel clearance of 2.12 m at the bow in the fully-loaded condition ensures that *Ocean Discovery* will handle the local conditions.

**Main engines**

*Ocean Discovery* is fitted with two Cummins KTA-19 main engines, each delivering 522 kW at 2100 rpm. Twin Disc MGX 5135 SC gearboxes, Aquamet 22 shafts and Teignbridge 5-bladed propellers complete the drive train. The stainless rudders are wrapped in a soft rubber compound to reduce damage to marine mammals in the unlikely event of a mammal surfacing under the stern gear. Similarly, a rubber-wrapped protective fin has been installed on the A-bracket in front of the propeller blades.

*Ocean Discovery* achieved a contract speed of 22 knots with the vessel fully loaded at 75% MCR. At 100% MCR, the fully loaded speed was 25 knots. In light load configuration, maximum speed achieved was 28 knots.

**Cabin**

The arrangement of the vessel has been customised to reflect the various eco-adventure tours operated by Pacific Whale Foundation. The vessel is configured for 149 passengers spread over two decks. A wide stair is located aft on the centreline, and port and starboard stairs located forward permit excellent access and smooth passenger mobility between decks.

The central bar is located on the main deck; a separate smaller wet bar is located on the upper deck. The vessel's stability is such that all passengers can be located on the upper deck without restriction when viewing whales.

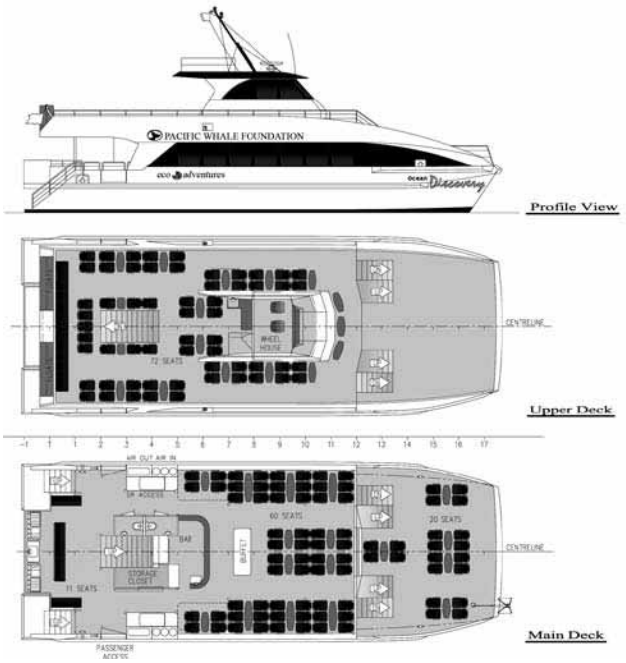
Table seating for 128 dinner guests is provided, including 20 seats/tables on the split-level foredeck and a further 48 seats/tables on the upper deck to make the most of the Hawaiian sunsets. Two barbeques are located at the rear of the main deck, and a large buffet area is positioned immediately forward of the main-deck bar. Heavy-duty sliding doors fitted forward on the main deck enable the cabin to be closed off in inclement weather.

Generous swim platforms, critical for snorkelling tours, are provided at the transom both port and stbd. Two WCs and a storage area are located centrally next to the stairs.

**Wheelhouse**

The raised wheelhouse provides excellent visibility for the skipper, and is configured for a central helm station with a second crew-member seat provided to port. Instrumentation includes a Furuno radar, Garmin GPS chart plotter, depth sounder and Ritchie magnetic compass, plus communications.


*Ocean Discovery*
(Photo courtesy One2three)




*Ocean Discovery* General Arrangement
(Drawing courtesy One2three)

**General Particulars**

| | |
|---|---|
| Length OA | 22.40 m |
| Length WL | 19.75 m |
| Beam | 8.20 m |
| Draught | 1.34 m |
| Capacities | |
| Fuel | 2 x 1700 L |
| Fresh Water | 870 L |
| Sullage | 870 L |
| Passengers | |
| Main Deck | 71 |
| Foredeck | 20 |
| Upper Deck | 72 |
| Total | 149 USCG Cat T |
| Service Speed | |
| Full Load | 25 kn |
| Light Load | 28 kn |
| Main Engines | 2 x Cummins KTA 19M4 each 522 kW at 2100 rpm |

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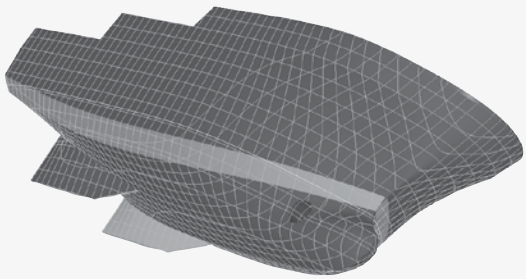
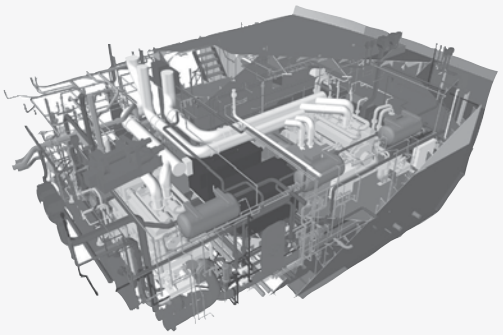


Maxsurf is an integrated suite of design, analysis and construction software suitable for all types of vessels. All modules feature a consistent, graphical Windows interface, work from a common database, and provide data exchange with AutoCAD and Microsoft Office.



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**40 m Monohull *Venetian Lady***

Island Boats are also due to launch in late November a 40 m sightseeing/dinner cruise charter vessel. Designed and styled by One2three, she is more like a motor yacht than a commercial vessel. Her luxurious interiors, featuring extensive use of granite and polished timber, and enormous galley housed below decks, ensure she is well suited to cater for a range of cruises including weddings, corporate and social events, and dinner cruise/sightseeing functions.

The vessel features two full-length enclosed passenger decks, each deck complete with service bar, dance floor and toilet facilities

Below deck spaces include the following

- steering compartment;
- engine room housing 2 x Cat C18s developing 522 kW each;
- tank compartment with large FW, sullage and fuel tanks;
- comprehensive galley to cater for 149 passengers, including cool room and walk in freezer; and
- crew accommodation space for delivery and re-location transits.

**30 m Catamarans at Brisbane Ship Constructions**

Two 30 m catamarans, for Townsville's SunFerries operation, are simultaneously nearing completion at Brisbane Ship Constructions. Custom designed by One2three, each vessel is configured for transit ferry operations to and from Magnetic Island. The vessels are also capable of Barrier Reef excursions, providing a back-up role for SunFerries' Reef Cat.

The design brief for these vessels required an efficient speed of 28 knots at 85% MCR, when carrying the standard load of 150 passengers and baggage. However, to cater for peak periods, the vessels must be able to maintain service speed when loaded with 300 passengers. Two vessels are required to maintain the busy year-round schedule, and both vessels will be introduced within days of each other.

Due for November 2006 launchings, both vessels will be delivered on their own bottoms to Townsville. The propulsion package consists of Cat C32 engines, each generating 895 kW at 2300 rpm, driving conventional propellers via Twin Disc gearboxes and duplex 2205 shafts.

Further details will be provided in a future edition of *The Australian Naval Architect*.

**40 knot Composite Day Boat**

One2three have designed a composite 12.1 m day boat under construction in Sydney by Atomic Marine. The first vessel is planned for launching in December and, if the market segment for these types of day vessels continues to expand, then it is likely that a production line of these vessels will commence shortly thereafter. Atomic were very specific with the vessel layout, and required maximum open deck space. Powered by two Volvo Penta sterndrives, the top speed will be around 40 knots.

Construction features a vinylester layup with a fully-cored bottom, side and decks, designed by Gurit. Construction jigs for the hull and deck were generated by One2three utilizing ShipConstructor software, with the MDF sheets being computer cut to maintain accuracy and reduce fabrication manhours.

An impression of the 40 kn day boat
(Image courtesy One2three)

The diversity of vessels designed by One2three will continue into 2007, with the following vessels currently under contract.

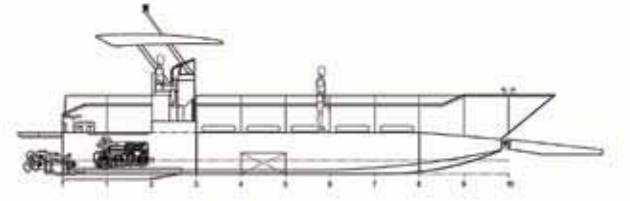
**20 m Catamaran — Island Boats**

Due for a May delivery, Island Boats has commenced construction of a 20 m, One2three custom-designed dive catamaran for Body Glove Cruises, Hawaii. The vessel will run alongside Body Glove's sailing trimaran, offering two dive/snorkel trips per day, followed by a sunset cocktail cruise. Configured for 149 passengers, the vessel's main deck features not one, but two, centrally-located bars, running six cocktail blenders. The primary focus of the vessel is to ensure a fun day out and, to this end, the vessel's open upper deck is equipped with a waterslide forward, a high dive gate, and barbeque facilities.

The engine rooms each have a Cummins QSL9-M diesel, delivering 300 kW per side for a top speed of 20 knots. Cruise speed is around 12 to 14 knots. FW and sullage tanks are located in the engine room, enabling the hull voids to be devoted to extensive storage areas for dive bottles and a wide range of water sports gear.

**14.5 m Landing Barge — Aluminium Boats**

Aluminium Boats have signed a contract for a 14.5 m landing barge, capable of delivering a range of trailerable watercraft and deck cargo. Designed by One2three, the vessel can also accommodate a Toyota LandCruiser. With a total project time of just seven weeks, the first landing barge is due for delivery in mid-January 2007. Powered by a Yanmar 313 kW engine driving a Doen 110 waterjet, the vessel is specifically designed for shallow-water operation and beach landings. Fabricated in aluminium, the landing craft's top speed is expected to be in excess of 25 knots.



Profile of the 14.5 m landing barge
(Drawing courtesy One2three)

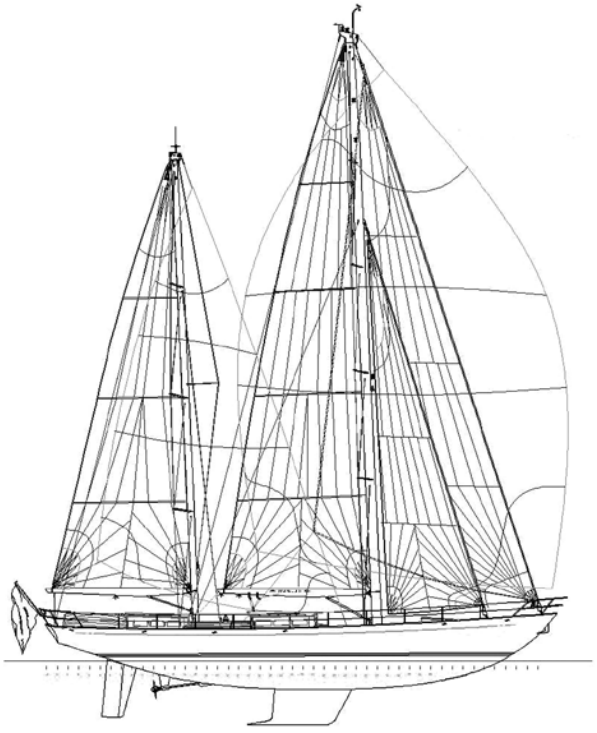
**24 m Sailing Ketch**

One2three have commenced the design of a 24 m steel ketch to be built locally. Principal designers Hoek Design Naval Architects of The Netherlands are providing the vessel's lines to the owner's layout. One2three are providing the structural design and naval architecture, including vessel systems.

Hoek Design describes the design as a combination of the elegance of the 1930s, with a modern underwater hull configuration. The vessel is part of the Truly Classic yacht series. The central design concept is a flush-deck boat with an aft cockpit, low deckhouse, sweeping sheer, moderate freeboard and long overhangs to bow and stern.

Like other Truly Classic yachts, the ketch is tailored for racing and has a strong performance pedigree, with a smaller 19.7 m vessel winning the Spirit of Tradition Class at Antigua Classic Week three years in a row. The owner has specified super-high-strength steel for hull and deck to reduce hull weights.

The vessel will also be used extensively for remote blue-water cruising, and is to be built to Lloyd's Class, including ice strengthening notation. An extensive timber fitout will ensure she stays true to form and reflects her 1930s style.



Profile of the 24 m steel ketch
(Drawing courtesy One2three)

Further details of these vessels will be provided in later issues of *The Australian Naval Architec*t. One2three would also like to take this opportunity to thank the Australian marine industry for all their support and encouragement over the last twelve months, and we look forward to a prosperous 2007 for all.

*Rob Tulk*

## Large Container Ships in Service

Setting a new standard for modern sea transport, the recently-completed *Emma Mærsk* and her sister ship *Estelle Mærsk* are very-large container ships built by Odense Steel Shipyard for the A.P. Moller-Maersk Group. The ships have a capacity of about 11 000 twenty-foot containers (TEU) and are 397 m long overall, 56 m in beam and have a depth of 30 m.

The propulsion machinery is a 14-cylinder Wärtsilä diesel engine from Doosan Engine Co. developing 80 000 kW at 102 rpm. To augment speed the propeller drive shaft is fitted with two electric motors. Five diesel generators with a combined power of 20 700 kW and one combined gas/steam turbine generator of 8500 kW (driven by the main engine exhaust) are installed.

A waste-heat recovery system is installed to optimise the use of the energy produced. The bunker fuel tanks are placed away from the outer part of the hull.

In the engine room and cargo holds, 8000 data signals are continuously monitored by an advanced, integrated computer system. The integrated computer system is fitted in the engine control room, but the system can also be remote-controlled from the navigating bridge and from the cargo control room.

The ships can carry 1000 forty-foot reefer containers. Quick and safe lashing of the containers on deck is made possible through the yard-patented lashing bridge.

The life-saving equipment consists of two 38-person lifeboats, six life rafts and one man-overboard boat.

Two bow and two stern thrusters, each with 245 kN of thrust, are fitted to facilitate easy manoeuvring in port. Rolling in adverse weather conditions is reduced by two pairs of active stabiliser fins.

Although the ships can be operated by a crew of only 13, accommodation is provided for 30 persons.

The introduction of these classes of very large ships has required new cranes to be installed in container ports around the world.

The 11 000 teu container ship *Emma Mærsk*
(Photo courtesy A.P. Moller-Mærsk)


Three super-postpanamax container gantry cranes arriving at the Port of Göteborg, Sweden, in August. Similar new cranes have recently been delivered to Australian ports. The cargo is a reminder of the importance of careful stability calculations! The crane supplier, the Shanghai Zhenhua Port Machinery Company in China operates thirteen similar ships for delivery of its products worldwide
(Photo courtesy Port of Göteborg)


The first US Navy Littoral Combat Ship was launched in Marinette, Wisconsin on 23 September. Named *Freedom*, LCS 1 is the first of the two competing designs to be launched — the other is under construction by Austal USA. *Freedom* is a steel monohull design, 114.5 m long overall, with a designed top speed of over 40 knots
(US Navy photograph)

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David Bricknell and Robert Skarda
Rolls-Royce Naval Marine, UK

This paper describes the development of a new class of Coastal Protection Vessels derived from a well-proven range of offshore standby vessels. These ships are flexible multi-role ships capable of providing emergency towing, firefighting and pollution control as well as general law enforcement, task-force co-ordination and survivor facilities. Sustained speed and long endurance in rough weather combined with a low crew-size, aviation facilities and fast rescue boats all contribute to a flexible government-response capability complementary to the current classes of customs cutters, research vessels and offshore patrol vessels. A range of coastal protection vessels have now been delivered to a number of customers worldwide with more ships currently under construction.

**Introduction**

Until 1967 a nation's jurisdiction over its adjacent sea effectively was limited to 3 miles; generally, although somewhat ambitiously, considered to have been derived from a 19th Century view of the range of a canon ball. In 1967 the 3-mile limit was replaced by a 12-mile limit (measured from the low waterline) and the water lying within this limit is considered the sovereign territory of the controlling nation, who then has rights over national security and customs affairs in the same manner as on land. Foreign ships however have 'rights of innocent passage' provided they are flying their nation's flags and are 'exposed', i.e. no submarines.

The Exclusive Economic Zone EEZ is an area beyond and adjacent to the territorial sea under in which the rights and jurisdiction of the coastal state and the rights and freedoms of other states are governed. The EEZ is regulated by the 1982 United Nations Convention on the Law of the Sea that came into effect in 1994. Part V of this convention describes the rights of the coastal state in the EEZ as sovereign rights for exploring and exploiting, and conserving and managing the natural resource of the waters superjacent to the seabed and of the seabed and its subsoil. Jurisdiction is provided for the establishment and use of artificial islands, installations and structures; marine scientific research; and for the protection and preservation of the marine environment. The EEZ extends up to 200 nautical miles from the low-water line.

The 12-mile 'sovereign territory' and the 200-mile EEZ have led governments to respond with assets capable of performing customs, coastguard and general policing and constabulary activities. Nations carry out their responsibilities through a wide range of organisations including fisheries-protection services, customs services, navies and others and use a wide range of assets, both air- and sea-based, to do this. For the sea-based assets, three vessel types are used mostly. These are:

- Customs cutter — this vessel has to implement a nation's sovereign territory responsibilities within the 12-mile limit — they tend to be relatively small, 10–40 m with limited range and no organic aviation.
- Research/surveillance vessel — these vessels conduct the marine scientific research defined by the convention — they are larger than customs vessels (generally over 40 m), are quiet in operation with good seakeeping and long endurance for patrol in the 200 n mile zone. They are not required to intervene where disputes occur or laws are being broken and, hence, are unarmed and, because they have no pursuit role, they have a relatively low maximum speed and again no organic aviation.
- Offshore patrol vessel — these vessels are normally operated by the country's navy and, because it delivers law enforcement (of the Convention's rights) within the EEZ, the vessels tend to be (lightly) armed and of a warlike appearance. OPVs will tend to be larger than research vessels, largely due to the requirement to land (and sometime to

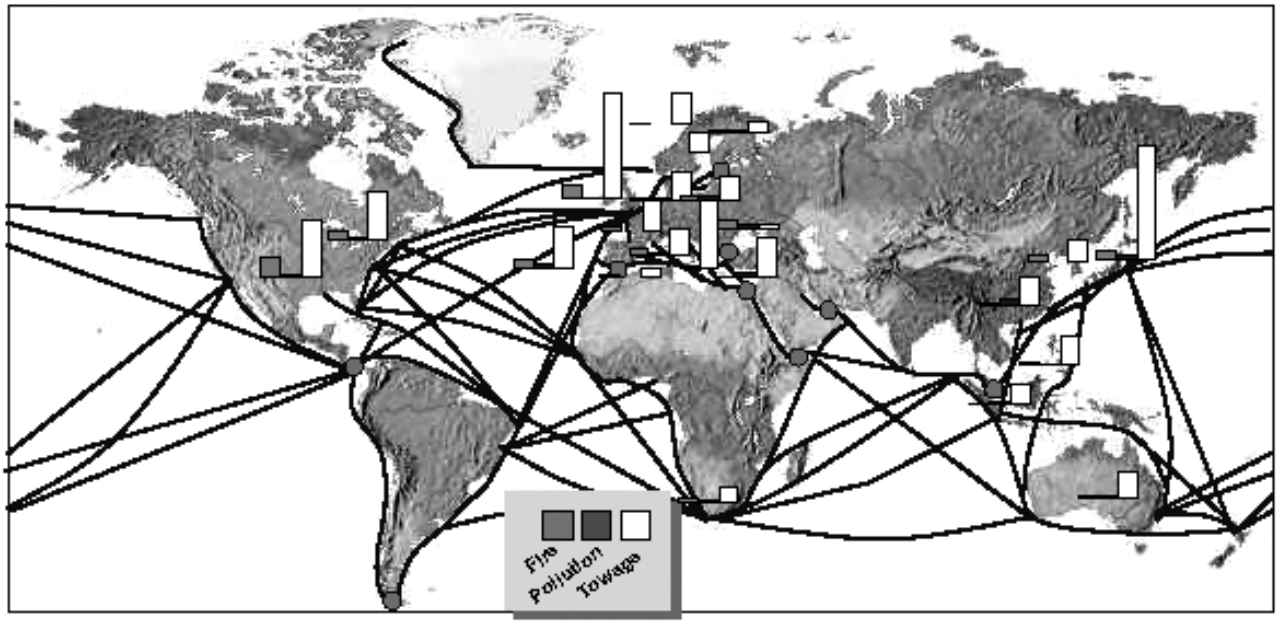



Figure 1 — Principal Trade Routes and Maritime Accidents by type shown by country or region. Data is IMO published data for 2001 to 2003 inclusive.

hangar) a helicopter — flight deck length can be a significant ship-size driver and ship motions to allow helicopter operation in higher sea-states are improved with longer ships. OPVs are also required to pursue ships which break the law within the EEZ and, as such, tend to be of a higher speed than the types of ships that are likely to be transgressing the law. In the case of the EEZ this is usually fishing vessels. Sustained speeds of 15 or 16 knots in high-sea states with sprint speeds of 20 or 21 knots are generally considered sufficient. Damage to the OPV can be expected, particularly during boarding or in worst cases being rammed, and so these vessels are designed to meet naval stability standards and are designed to be more robust than a naval combatant.

None of the above ship types, however, adequately covers a subject that is increasingly of concern to nation states in and around their coastline, territorial waters and EEZ: the containment or prevention of marine accidents and minimising of the after effects. In order to implement these roles a different class of vessel is required — one which includes capabilities such as high bollard-pull for towing of stricken vessels, fire-fighting, and pollution control as well as disaster relief in the case of a significant number of casualties. Such vessels are, as a secondary capability, often capable of delivering other roles, including general law-enforcement and fisheries patrol as well. This paper describes a range of coastal protection vessels developed to meet the growing requirement to prevent and deal with marine accidents.

**Marine Accidents**

Marine accidents within, and outside of, a country's EEZ have the potential to cause considerable damage to the marine life and to the coastal eco-system as well as to passengers and crew aboard any stricken vessel or vessels. Constant vigilance, coupled with the ability to respond rapidly, ideally before such an emergency becomes a disaster, requires a new class of vessels designed specifically for the task and sufficiently multi-capable to be able to deal with a variety of potential disasters. Figure 1 shows the volume of marine traffic around the world and, against this, it is little surprise that accidents are concentrated off the coasts of particular countries.

Analysis of these accidents shows that most require emergency towage. Of course, timely intervention by a suitably-equipped towing vessel can prevent an emergency becoming a crisis, but fire on the stricken vessel and any pollution from that vessel can have a quite disproportionate impact on the local marine ecosystem and any dependant industries. Both fire and pollution incidents identified in the figure leave little doubt that this is an issue which needs addressing.

**Characteristics of a Coastal Protection Vessel**

The characteristics required of such emergency-response vessels are those developed following recent marine accidents. These include: emergency towing capability (bollard pull); fire-fighting; pollution control — oil spill containment, skimming and processing capability; and survivor facilities for people recovered from the sea or from the stricken ships. Ship speed is important for timely response to the emergency, but the required hull characteristics for a fast vessel are not always in line with the characteristics required for high bollard pull or for pollution control. Vessels speeds of 18 to about 20 knots are seen as achievable.

**Emergency Towing**

Most offshore patrol vessels are specified as being required to tow a vessel of similar size in a moderate sea state. This requirement has little impact on the vessel's propeller characteristics required for maximum speed but, equally, will make little impact on a stricken oil tanker which is likely to be many times greater in displacement. High bollard pull, required by coastal protection vessels, is the delivery of thrust at low speeds and influences both the propeller diameter, a nozzle (if fitted) and the hull-lines aft in order to achieve good water inflow conditions. Higher-speed ships will invariably avoid the additional drag of a nozzle propeller, whereas pure emergency towing vessels will adopt nozzles in order to keep propeller diameter to a reasonable size whilst delivering around 50% higher thrust at the same speed as an open propeller. Typically, the additional thrust benefit of a nozzle decreases rapidly to just a few percent when beyond 10 knots or so. As an example an emergency towing vessel may achieve 150 t bollard pull (suitable for a stricken ship of around 250 000 t) from 2 x 4.5 MW on 3.7 m diameter nozzle propellers with a maximum ship speed of 15.5 knots. A similar but higher maximum speed ship (19.5 knots) designed more for multi-purpose coastal protection will achieve the same bollard pull from the same diameter nozzle propeller but requires 2 x 6 MW of engine power.

**Fire-fighting**

A significant number of marine accidents are due to fire. In order to address fire at sea, the coastal protection vessel will need to deliver water onto the stricken vessel from alongside or from standing-off some distance. Three standards of firefighting capabilities are defined by classiffication societies. These are:

FiFi I: vessels are equipped with at least two monitors that, in total, have a discharge rate of 2400 $m^3/h$. The monitors are able to throw water to a height of 45 m and to a minimum of 120 m distance.

FiFi II: vessels equipped with three or four monitors that, in total, are able to deliver 7200 $m^3/h$ a distance of 150 m and to a height of 70 m.

FiFi III: vessels equipped with three or four monitors capable of delivering 9600 $m^3/h$ a distance of 150 m and to a height of 70 m.

**Pollution Control Operations**

In the case of stricken vessels, the oil spill source will be known but often oil spills will arise either before the vessel is known to be in danger or from some other cause and, in these cases, the detection of the pollution from airborne assets becomes important. Once oil is spilled, mechanical containment by booms, usually deployed by small boats, and mechanical recovery or skimming provides the means of containment and recovery. Effective coordination of the pollution incident means that any coastal protection vessel will need to be equipped with extensive command, control and communications capability. Described below is a typical evolution for a pollution incident by a coastal protection vessel (CPV).

On arrival in the near vicinity of the spill, the CPV locates the spill/slick. The approach to the spill is decided based

on the size and nature of the spill, wind direction and sea state and oil-spill modeling software can be utilised in this task. A sample is taken and tested in the on-board laboratory to determine the physical properties, like specific gravity, viscosity, turbidity of the oil and other chemical properties like pH, and HC content to determine the need and rate for dosing with demulsifying agents.

Anti-pollution equipment is stored onboard in dedicated storage in such a position as to follow the sequence of deployment. The above-deck equipment is deployed by deck cranes installed on the aft deck; below decks this is handled by hydraulically-operated hand fork-lifts.

Deployment of the boom is achieved using an anti-pollution boat lowered from a heave-compensated davit, enabling launching and retrieval in high sea-states. The boom end is attached to the anti-pollution boat and the boat is moved such that the boom contains the slick from spreading. This operation also helps in making the oil film much thicker and concentrated in a small area to facilitate easy pumping-in with help of a suitable weir/disc-type skimmer. During the initial phase of the operation, the CPV may hold position and thereafter start moving against the wind at a slow speed of 2–5 knots. The pumped-in polluted water is received at a manifold station on the deck.

Depending upon the size and nature (e.g. small-to-medium size and a cohesive bulk) of the slick and the prevailing wind and sea state at the time of operation, it may be possible to deploy mechanical sweeping arms. With the sweeping arms deployed, the vessel moves at a slow speed of 2–5 knots collecting maximum oil in the area between the ship's side and the sweeping arm. A pump located at the base of the sweeping arm starts pumping the polluted water. The pumped-in polluted water is received at a manifold station on the deck and the receiving manifold station has a set of strainers, a facility to inject emulsion-breaking chemicals, and a set of valves to direct the incoming fluid to the relevant tanks.

The collected polluted water is allowed to settle in a settling tank and the separation of oil and water is achieved by way of gravity separation. The rate of separation is dependent upon the differential specific gravity with a retention time of 20–30 min generally used for continuous recovery of oil. The settled water is pumped out in front of the sweeping arm within the contained area, with the rate of disposal in proportion to the rate of intake. An oil discharge monitoring system will monitor the operation till the disposable water achieves the required quality. The whole oil-recovery operation is monitored and assets controlled from the vessel's operation control room

The recovered oil is stored in on-board storage tanks provided for the purpose, but may also be transferred into towable, flexible, inflatable barges.

**Coastal Protection Vessels**

Coastal protection vessels have been delivered into a number of key geographical areas. These are owned and operated on a country-by-country basis. Ownership of the assets varies with some privately owned and operated on behalf of a coastguard agency, and others owned and operated directly by coastguard agencies, and even by navies. Despite the effects of marine accidents respecting no political boundaries, there appears to be no obvious signs of shared resources but this may come in the future.

**Emergency Towing Vessels**

The United Kingdom's Emergency Towing Vessel (ETV) scheme aims to protect the country from marine pollution arising from drifting disabled ships. *Anglian Princess,* operated by Klyne Tugs, is a UT719-T design with a bollard pull of about 180 t. She was built at the Yantai Raffles yard in China, and is now on long-term charter to the UK's Maritime and Coastguard Agency and is based in Dover. The design is a development of the basic UT719 platform. To date, seven vessels have been built as multi-functional tug supply vessels, with a further three on order. Two more have been built under the UT719-R label as field safety standby vessels for the North Sea.


Figure 2 — *Anglian Princess* UT719-T UK Emergency Towing Vessel

The Klyne Tugs UT719-T vessel (Figure 2) is optimised for towing and anchor handling, but also has a substantial supply capacity and a FiFi 1 firefighting outfit. She is 67.4 m long, has a beam of 15.5 m and a design draught of 5.2 m. Built to Lloyd's Register class ✠100A1✠LMC, UMS, FiFi-1, it is powered by two medium speed engines providing 6 000 kW. Maneuverability is high, with two independent high lift rudders and two 600 kW tunnel thrusters at the bow and a single 900 kW unit at the stern.

Two powerful towing and pollution-prevention vessels are currently under construction at the Zamakona shipyard for the Spanish Marine Safety Agency SASEMAR. These vessels are a derivative of the UT722L offshore design (Figure 3), and will have a main engine power of 16 000 kW giving a bollard pull in excess of 220 t. Several types of oil skimmer system will be fitted, in conjunction with a very large capacity for recovered oil of 1700 $m^3$. In addition to a large towing winch, there will be a foredeck winch and fendering for escort work.

**Multi-Purpose Coastal Protection Vessels**

Multi-purpose coastal protection vessels are designed to undertake a variety of coastguard and EEZ management roles, including standby and rescue, firefighting, salvage and general law enforcement and fishery control.

Three countries have recently acquired multi-purpose coastal protection vessels. France has acquired the UT515, Norway the UT 512, and India the UT517. These vessels share similar characteristics.

**France:** Type-numbered UT515, the 80 m long vessels will

Figure 3 — UT-722L Emergency Towing and Pollution Control Vessel for Spain showing the very-large nozzled propellers necessary for such a very high bollard pull vessel.

combine towing, salvage, coastguard and safety standby capability. An installed power of 16 000 kW will provide a bollard pull of about 200 t and a speed of 19.5 knots.


Figure 4 — The UT-515 Coastal Protection Vessel for France combined very high bollard pull with a high ship speed.

The Les Abeilles company in Groupe Bourbon operate these ships on a long-term charter to the French Navy. The ships were built at Myklebust Verft, one of the Kleven Maritime yards in Norway.

**Norway:** The UT512 design for Norway, K/V *Harstad,* is from the same family as the UT515 and has been acquired by Remøy Shipping for charter to the Norwegian Coastguard for a comparable coastprotection role. The vessel was built at Aker Søvikness on the West coast of Norway.

K/V *Harstad* (Figures 5 and 6) is designed and fitted for emergency towing of tankers up to about 200 000 dwt and has a full outfit of oil-spill control equipment with a tank capacity for recovered oil of more than 1000 $m^3$. She has a bollard pull of about 110 t and a ship speed of about 18.5 knots to enable the vessel to reach the scene of an accident quickly. As its roles will include patrolling, the ship will have fast boarding/rescue boats, a gun on the foredeck and a comprehensive civil and military communications system. Like other Norwegian coastguard vessels, the crew of 26 will be a mix of civilian and military personnel. The 83 m long vessel will be owned and operated by Remøy Shipping, on long-term charter to Kystvakten.

Operating along the full length of Norway's coastline and throughout the country's exclusive economic zone will involve much time spent in the Barents Sea, so ice 1B class has been specified, along with anti-icing measures such


Figure 5 — K/V *Harstad,* a UT512 recently accepted by the Norwegian Coastguard as a multi-purpose Coastguard Vessel. Ship's armament has not yet been fitted.


Figure 6 — UT512 Norwegian Coastguard Protection Vessel showing the extensive working deck aft

as heated shelters for the two MOB/boarding boats. The twin controllable-pitch nozzle propeller propulsion system delivers the required balance of a high top speed of about 20 knots and a bollard-pull of more than 100 t, suitable for the vessel's many operating roles.

For towing and emergency work, this particular UT512 design includes a towing winch, a reinforced pushbow, Fi-Fi 1 fire-fighting systems, a hospital and an extensive range of ancillary equipment including line-throwing gear, a harpoon system for attaching tow lines, oil spill booms and skimmers and 1000 $m^3$ of tankage for recovered oil.

**India:** A predicted 100% increase in oil demand in India over the next 20 years will radically increase tanker traffic in India's EEZ. The Indian Coast Guard is building three vessels at the ABG shipyard in Surat to counteract potential marine incidents. The UT517s (Figure 7) are 93 m-long vessels designed to carry a medium-sized helicopter and be equipped with oil booms and skimmers, the recovered oil either being held in tanks on board or transferred to inflatable barges that can be towed astern. Apart from the pollution, control role, the vessels will undertake many other EEZ-related duties, including surveillance and law enforcement, anti-smuggling, fishery protection, SAR, data collection and assistance with salvage and fire fighting.

Figure 7 — UT517 Indian Coastguard Pollution Control Vessel

**Coastal Protection Vessel with Survivor Capability**

With the memory of recent coastal disasters in mind, a multi-capable, multi-purpose coastal protection vessel has been developed from the latest North Sea multi-field standby vessel, the UT527. In its commercial role, the vessel has been designed specifically for oil recovery, rescue, towing and firefighting but what differentiates the vessel from other CPVs are the extensive survivor facilities on-board and the time the ship remains available at sea. The ship has been designed to enable it to remain at sea for three *years* without return: it changes its crew at sea, and it re-stores and replenishes at sea. To enable such an extensive operational period the ships systems, including its power and propulsion system, are designed not only to be low maintenance but also to be easily maintainable at sea as well as graceful in its degradation should unplanned failures occur.

Figure 8 — UT527 Multi-field Standby Vessel on trials

Although primarily a multi-field standby vessel, it is readily adapted for a wide range of coastal protection duties. Built to Det Norsk Veritas class ✠1A1, EO, FIFI I/II it is capable of over 20 knots and can launch and berth her own rescue/work boat, used for towing oil booms in the stern. Oil recovery systems meet DNV oil recovery and NOFO specifications, as shown in Figure 9.

In its coastal protection role the vessel's strengths are in fire fighting, pollution control, emergency towing (up to 130 t bollard pull) and survivor recovery (up to 320 survivors) as well as implementing essential command and control of situations. General law enforcement and fisheries patrol are additional capabilities. Long endurance or time on station (20 000 nm at 16 knots), a maximum speed of greater than 20 knots, the ability to maintain station in high sea-states, a stern well for launching fast boats, a medium size helicopter and space for survivors or embarked military forces identifies this ship as potential for both disaster relief activities or for maritime counter terrorism activities. The UT527 as a CPV is illustrated in Figure 10.


Figure 10 — UT527 Multi-role, multi-capable Coastal Protection Vessel 5

**Acknowledgements**

The authors would like to acknowledge the innovative design work undertaken by the UT-design team at Rolls-Royce AS in developing this new class of ship.

*This paper was presented at the Pacific 2006 International Maritime Conference in Sydney, February 2006.*

Figure 9 — UT527 Multi-field Standby Vessel demonstrating its fire fighting, pollution control and survivor recovery capabilities. Immediately noticeable are the capabilities for a medium size helicopter and dock/ramp for far interception or recovery boat

# EDUCATION NEWS

## The University of New South Wales

### Undergraduate News

### Visit to AMC

On 4 and 5 September, Tracie Barber visited the Australian Maritime College with the third-year naval architecture students from UNSW who are studying ship hydrodynamics. The visit was paced over two days and was most ably organised by Gregor Macfarlane, and UNSW is grateful for his hospitality. In addition, we appreciate the hospitality of Richard Young, Jonathan Duffy, Paul Brandner (and PhD student Bryce), John Wakeford (and Porky) and Ian Smith who showed us the various facilities. We also enjoyed the hospitality of the bus driver who drove us to Beauty Point and left us wondering if they do, indeed, serve seahorse at the restaurant at Seahorse World.

The experience the students gained by using the towing tank for resistance and motion tests together with the inspection of the other experimental facilities (the shiphandling simulator, the cavitation tunnel, the circulating-water tunnel and the ship-model basin) was most valuable and was a great addition to their theoretical studies at UNSW.

In return, Tracie gave an evening presentation in an area not entirely related to naval architecture (automotive aerodynamics), after which the staff and students from both institutions enjoyed an evening at the local pub.

### Graduation

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

| | |
|---|---|
| Aaron Carle | Honours Class 1 |
| Robert McConachie | Honours Class 2, Division 1 |
| Brett Morris | |

Congratulations, all!

They are now employed as follows:

| | |
|---|---|
| Aaron Carle | Austal Ships, Fremantle |
| Robert McConachie | Centre for Maritime Engineering, Defence Materiel Organisation, Sydney |
| Brett Morris | Directorate of Navy Platform Systems, Department of Defence, Canberra |

### Thesis Conference

At the School's annual undergraduate thesis conference on 12 and 13 October the following presentations were made by naval architecture (and some other) students on their projects:

Trevor Allan: *A Feasibility and Design Study for a Reef-watching Submarine*

Hasan Farazi: *Strength Characteristics of Vacuum-Infused Sandwich Composite Panels*

Stephen Helmstedt: *Optimal Spacing for Energetech Wave Farm*

Jun Ikeda: *Analysis of Broaching Loads on Keel Structures of Composite Yachts*

Andrew Joyce: *Performance Analysis of a Volvo 70 Canting-keeled Yacht*

Regina Lee: *Analysis of the AMC Flume Tank*

John Marsh: *Development of an Optimised Surf Fin*

Richard Milne: *Hydrofoil Assistance for Yachts*

Joanna Mycroft: *Structural Analysis of a J/24 Rudder*

Mate Ostojic: *Preventing Parametric Roll with Passive Anti-roll Tanks*

Hiroki Sunayama: *Mathematical Ship Model for Manoeuvring*

Brett Moris, Aaron Carle and Robert McConachie at the UNSW graduation ceremony on 19 September (Photo courtesy Kylie Lysowec)

Regina Lee at the announcement of her winning the RINA–Austal Ships Award for 2006 (Photo courtesy Francesca Muskovic)

Representatives from industry at the conference included Sam Abbott from Austal Ships in Fremantle, Dan Curtis from the Directorate of Navy Platform Systems in Canberra and Geoff Wilhelm from the Defence Materiel Organisation in Sydney.

RINA and Austal Ships jointly offered an award of $500 and a certificate for the best presentation at the conference by a student member on a naval architectural project. Assessment was made on the basis of marks awarded by School staff, with marks being standardised to remove the effects of marker variability. The award went to Regina Lee for her presentation on *Analysis of the AMC Flume Tank*, and was

announced at the thesis conference dinner at the Moore Park Golf Club on the evening of 13 October. Congratulations, Regina!

Also at the thesis conference dinner, the School's 174 final-year students made their annual award for Lecturer of the Year, inaugurated in 1995. This year the Lecturer of the Year award went to A/Prof. Robin Ford, attending his last Thesis Conference dinner before retirement.

*Phil Helmore*

Lecturer Phil Helmore with naval architecture students Regina Lee, Joanna Mycroft and Andrew Joyce at the Thesis Conference Dinner (Photo courtesy Francesca Muskovic)

## Post-graduate and Other News

### Twenty-sixth Symposium on Naval Hydrodynamics

The Symposia on Naval Hydrodynamics are run under the auspices of the Office of Naval Research (ONR) in Washington and take place every two years. On this occasion, the 26th symposium was held in Rome, Italy, on 17–22 September 2006, and the standard five-day format was followed. In addition to the ONR, the Italian Ship Model Basin (INSEAN), the Marina Militare Italiana, Office of Naval Research Global (ONRG, UK), Bollettino Universita e Ricerca (BUR) and Alitalia were co-sponsers. The local organising committee consisted of a number of researchers from INSEAN in Rome.

A total of 87 papers on all aspects of ship hydrodynamics was presented. This total included four keynote lectures and the Weinblum Lecture. There were 46 attendees from 20 countries. On this occasion, there was just one Australian contribution.

Professor Lawrence Doctors (UNSW) and Mr Chris McKesson from the JJMA Naval Architecture Division, Alion Science and Technology, USA, presented their work on *The Resistance Components of a Surface-effect Ship*. The work described in their paper, in particular, covers the prediction of the drag of the seals of a surface-effect ship (SES) when operated in a partial-cushion mode. That is, the results have application to the prediction of the power requirements of an SES when it is intended to loiter for long periods of time, rather than travel at high speeds. The new and sophisticated theory developed now includes the drag developed by the planing action of the two seals, as well as the less-significant frictional increases. This theory was shown to provide excellent and considerably-improved predictions of the total drag suffered by these vehicles in the all-important low-speed range.

The next conference in the series, namely the Twenty-seventh Symposium on Naval Hydrodynamics, will take place in Sydney on 17–22 August 2008. This is the first occasion on which this significant event will take place in Australia. Further information can be obtained on the last conference and the next one from Prof. L. Doctors at l.doctors@unsw.edu.au.

## Australian Maritime College

### AMC and the University of Tasmania to Integrate

The Australian Maritime College and the University of Tasmania signed a Heads of Agreement on 17 October 2006 which sets out the basis on which the UTAS/AMC integration will proceed. This follows a period of detailed discussion between UTas, AMC and the Government agencies responsible for the two institutions.

The Acting President of the AMC, Professor Tom Hardy, said that at no time in Australian history has the need for high-quality maritime education, training and research been so starkly evident. "By joining forces with the University of Tasmania, AMC, as Australia's national maritime institute, will be able to reallocate resources to lead the way in several areas of vital importance to our economic well-being, national security and protection of the marine environment," he said. "Bringing together our people and facilities gives us the chance to expand Tasmania's reputation and expertise in maritime-related studies, including naval architecture, ocean engineering and maritime hydrodynamics, integrated transport logistics, marine science and technology, fisheries and sustainable management of ocean resources. Tasmania will improve its position as an international leader in maritime education, training and research," said Professor Hardy.

The Vice-Chancellor of UTas, Professor Daryl Le Grew, said that "The University of Tasmania and the Australian Maritime College have an exciting future together". "The UTas/AMC integration is part of a vision to establish Launceston as an internationally-recognised location for the provision of maritime and maritime-related education, training and research drawing on the strengths of both institutions," he said.

AMC will retain its title and logo for the purposes of branding, publicity and marketing of the AMC as a distinct institute of UTas. AMC will remain based on its current sites in Launceston and Beauty Point. There will be a period of transition in 2007 during which finalisation of funding, governance and other implementation arrangements will take place. Formal integration is planned from 1 January 2008.

The Australian Government will provide funding from the Collaboration and Structural Reform Fund to assist with the implementation of the integration. An initial amount of $2.5 million will be provided in 2006. Integration offers opportunities for staff and students through a renewed or enhanced range of undergraduate and postgraduate courses and research activities.

**FTV *Bluefin* Voyage for AMC Naval Architecture Students**

Third year AMC BE Naval Architecture students headed to sea recently for a voyage on the AMC's 35 m fisheries training vessel, *Bluefin*. The one-week trip, organised by Giles Thomas and Paul Furness, gave students a unique opportunity to put theory into practice and learn about life onboard a vessel. Two groups of students took part — the first embarked at Swansea, after which *Bluefin* headed north up the east coast of Tasmania. A changeover of student groups took place off the rocks at Eddystone Point, and the second group stayed on-board until *Bluefin* berthed back at Beauty Point on the north coast.

The students conducted a series of activities whilst onboard. Speed and manoeuvring trials were planned, performed, analysed and presented by the students. They also conducted a series of structural investigations to increase understanding of how the vessel was designed and constructed. Students also conducted a number of design exercises where aspects of the vessel such as the bridge, aft working deck and accommodation/mess area were redesigned after consultation with the crew. A hydrostatic analysis was carried out to determine the vessel's trim and stability characteristics, given her loading conditions; this led to an estimate of her rolling behaviour. In addition, seakeeping measurements were performed and a range of fishing activities undertaken. The benefits of such a trip are seen to be substantial in terms of student understanding of vessels and their operations. In particular, some reasonably rough weather was encountered which gave students an appreciation of the importance of improving seakeeping performance of ships.


One of the groups of AMC Third-year naval architecture students who spent a few days onboard FTV *Bluefin*
(Photo courtesy AMC)

**Ocean Vehicle Design Presentations**

In their final year of study, BE naval architecture students undertake a design project in the unit Ocean Vehicle Design, working in teams to a specification supplied by an industry 'client'. In September six teams presented their designs to an audience of staff, students and industry experts. The designs and their industry 'clients' were:

40 m day-trip catamaran — Austal Ships
Offshore support vessel — Sinclair, Knight, Mertz
Harbour tug — McAlpine Marine Design

Third-year AMC naval architecture students learning "on the job" onboard FTV *Bluefin*
(Photo courtesy AMC)

24 m commuter catamaran — Incat Crowther Design
Southern Ocean patrol vessel — Department of Defence
Charter fishing vessel — Alan Muir and Associates

The marking panel included Mr Nikolai Ivanvic from Austal Ships, Mr Dan Curtis from the Directorate of Navy Platform Systems and Mr Alan Muir, consultant naval architect. The team judged to have produced the best oral presentation was Poseidon Designs comprising Brendan Campbell, Lachlan Carlier, Kaspar Hebblewhite and John Polmear.

A view of the offshore support vessel designed by Poseidon Design
(Image courtesy AMC)

**Final Year Engineering Student Research Thesis Presentations**

Fourth-year engineering students presented their research thesis findings on Friday, 20 October 2006. There was a vast range of topics covered, as can be seen in the list provided below. Twenty-nine students from Bachelor of Engineering courses in Naval Architecture, Ocean Engineering and Marine and Offshore Systems made their final presentations. The students were judged by Dr Stuart Cannon of the Defence Science and Technology Organisation, Dr Paul Sincock of AMOG Consulting, Prof. Mike Davis of the University of Tasmania and Mr Rob Gehling of the Australian Maritime Safety Authority. A number of other industry representatives also attended, including Ray Duggan from the Department of Defence and Terry Turner, from DSTO. The presentations were followed by a very lively dinner attended by all final year BE students, AMC maritime engineering staff and moderators.

*Experimental Equipment for Investigating Ship Hydrostatic Principles,* Lachlan Carlier, naval architecture, supervisors Norman Lawrence and Paul Furness.

*Comparative Analysis between High-Speed Monohulls and Catamarans*, Peter Tomic, naval architecture, supervisor Giles Thomas.

*Experimental Investigation into the Effects of Vortex Generators on Waterjet Inlet Flow Behaviour*, Edward Dawson, naval architecture, supervisors Paul Brandner and Greg Walker (UTas).

*Numerical Model of Tidal and Wind Driven Currents at Parker Point in the Port of Dampier*, Graeme Boyle, ocean engineering, supervisor Tom Hardy.

*An Experimental Study into the Effects of Fishtailing on a Turret Moored FPSO*, Mitchell Stone, ocean engineering, supervisors Christopher Chin and Colin Paton (AMOG Consulting).

*Hydrodynamic Properties of a Suction Can in Subsea Lifting and Lowering*, Joel Ireland, ocean engineering, supervisors Gregor Macfarlane and Yuryi Drobyshevski (Intec Engineering).

*Investigation of Hull Cavities for Drag Reduction for Fast Craft*, Russel Brice, naval architecture, supervisor Paul Brandner.

*A Study into the Effect of Fibre Orientation and Lay-up of Deep and Ultra-Deep Water Composite Risers Subjected to Static Loading*, Michael Ray, ocean engineering, supervisor Irene Penesis.

*Preliminary Design and Optimisation of Wageningen B-Series Propellers*, Brendan Campbell, naval architecture, supervisor Prasanta Sahoo.

*Gyroscopic Stabilisation of Ships*, James Atkinson, naval architecture, supervisors Gregor Macfarlane and Paul Steinmann (Halcyon).

*Experimental Testing of the Mullaya AUV*, Daniel Atkins, ocean engineering, supervisor Dev Ranmuthugala.

*Power Generation from Freewheeling Yacht Propellers*, Tom Urie, naval architecture, supervisors Laurie Goldsworthy and Paul Brandner.

*Vessel to Vessel Interaction — Replenishment at Sea*, Tristan Andrewartha, naval architecture, supervisor Giles Thomas and Terry Turner (DSTO).

*Rolling of Catamarans*, Mani Hackett, naval architecture, supervisor Giles Thomas.

*Theoretical and Experimental Study of Motions of Trimarans*, Kaspar Hebblewhite, naval architecture, supervisor Prasanta Sahoo.

*Effect of Entrained Water on the Surface Motion of a Generic Submarine*, Jay El-Atm, naval architecture, supervisors Dev Ranmuthugala and Gregor Macfarlane.

*Identifying Energy Utilisation Measures by Systematic Application of Driving Force and Dimensionless Numbers to System Energy Audits*, Matt Playford, marine and offshore systems engineering, supervisor Alan Belle.

*Effects of Bathymetry on Hydrodynamics of an LNG Terminal*, Dash Swift, ocean engineering, supervisors Norman Lawrence and Dev Ranmuthugala.

*Investigation of the Affect of Surface Condition on Adhesive Bond Strength of Elastomer Bonded Aluminium in Maritime Applications*, Justin Bentink, naval architecture, supervisor Alan Belle.

*Investigating the Environmental Impact of a Marine Vessel and a Methodology for Optimising the Power Transmission System*, Tristan Williams, naval architecture, supervisors Laurie Goldsworthy, Gregor Macfarlane and Jonathon Duffy.

*A Comparison of the Performance and Emissions of Diesel Engines using Diesel and Bio-Diesel*, Giles Mitchell, marine and offshore systems engineering, supervisors Norman Lawrence and Laurie Goldsworthy.

*Investigations into Hydrodynamics and Seamat-Soil Interaction of Concrete Stabilizing Pipe Mattresses*, Tegan Kay, ocean engineering, supervisors Irene Penesis, Dev Ranmuthugala and Jackson Dryne.

*Active Buoyancy Control using Trim Analysis*, Clinton Duncan, ocean engineering, supervisors Dev Ranmuthugala and Jan Soeholt.

*Bulbous Bow Optimisation for Fishing Vessels*, James Barton, naval architecture, supervisor Prasanta Sahoo.

*Investigation into Parametric Roll of Containerships in Head Seas*, Ryan Watts, naval architecture, supervisor Jonathon Duffy.

*Water Stilling for Towing Tank Experiments*, John Polmear, naval architecture, supervisor Giles Thomas.

*Development of Rudder Roll Stabilisation Systems*, Richard Jeffries, naval architecture, supervisors Hung Nguyen and Christopher Chin.

*Alternative Fuels for Diesel Engines*, Greg Hansen, marine and offshore systems engineering, supervisor Laurie Goldsworthy.

*Ship-bank Interaction and Ship Squat: A Case Study for the Port of Townsville*, Mitchell Pike, naval architecture, supervisor Jonathon Duffy.

**Annual UNSW Naval Architecture Student Visit to AMC**

On 29 and 30 August AMC again hosted the third-year naval architecture students from the University of NSW for a series of laboratory sessions in the towing tank, cavitation tunnel, model test basin, ship handling simulator and circulating water channel. The ten UNSW students were accompanied by Dr Tracie Barber, UNSW Senior Lecturer. Tracie gave a presentation on *Automotive Aerodynamics at UNSW* to students from both AMC and UNSW, and AMC staff. The seminar was followed by a counter-meal at a local pub which gave students from both AMC and UNSW the opportunity to compare notes.

**AMC/RINA Seminar Series**

The series of technical seminars continued at the AMC this semester. Presentations included:

Suzanne Hutchison, AMC PhD candidate: *Launch and Recovery Systems*.

Vikram Garaniya, AMC PhD candidate: *Combustion Modelling of Heavy Fuel Oil Droplets at Different Heating Rates*.

Gregor Macfarlane, AMC Towing Tank and Model Test Basin Manager: *Correlation of Model and Full Scale Wave Wake Characteristics*.

Dr Laurie Goldsworthy, AMC Senior Lecturer: *Design and Implementation of the AMC High Pressure Spray Test Chamber*.

Roberto Ojeda, AMC PhD candidate: *Geometric Non-linear Analysis of Stiffened Plates*.

Dr Tracie Barber, Senior Lecturer, University of New South Wales: *Automotive Aerodynamics at UNSW*.

Dr Paul Brander, AMC Cavitation Tunnel Manager: *Development of an Australian National Facility for Cavitation Research*.

Dr Hung Nguyen, AMC Lecturer: *Automatic Manoeuvring Systems for Surface Vessels*.

Chin H. Bong, AMC PhD candidate: *Star-CD Simulation on Non-evaporating Diesel Spray*.

# THE INTERNET

### Where Is

Have you ever wanted an online Australian road map/street directory? The Whereis website at www.whereis.com.au has provided the answer, and now you can do it with a few clicks of the mouse. Select your city or town, and maybe a street and number, and click the Get Map button. Then use the Map Zoom Slider to zoom in or out quickly, and click anywhere on the map to re-centre, or on an edge to go to the adjoining map. Zooming right in takes you to house level, and zooming right out takes you to state road-map level. This is a good guide to Australia.

*Phil Helmore*

# THE PROFESSION

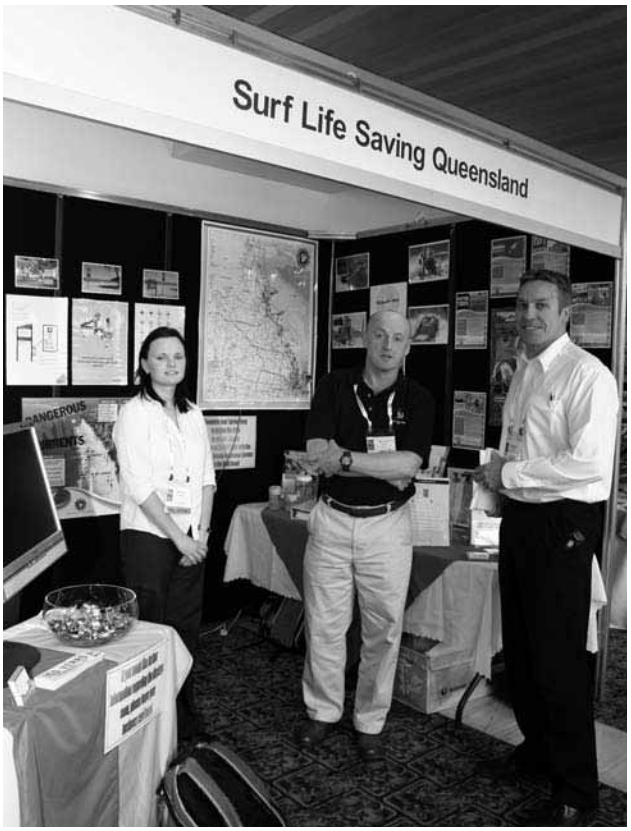
### Marine Safety Conference 2006

The Marine Safety Conference 2006, held on the Gold Coast from 12–14 September, saw 350 government and industry representatives unite in their commitment to the future of marine safety, canvassing issues that will help map the way forward *Towards 2010*. More than 60 speakers outlined safety initiatives in recreational boating, search-and-rescue and investigations of accidents, technical developments and standards, and training.

Conference highlights included presentations by Professor Michael Tipton from the University of Portsmouth, UK, President of the American Boat and Yacht Council, Skip Burdon, local incidents researchers Samantha Diplock and Joan Ozanne-Smith, boat designers and innovators Alan Dowd and Don Fry, Australian Antarctic Division's Mick Davidson, the holding of the Australian Maritime Safety Authority (AMSA) Shipping Symposium, and several interactive discussion panels on construction standards, marine surveying, personal flotation devices, training and skills shortages, and the fishing industry.

In his presentation on *Essentials of Sea Survival*, Professor Michael Tipton reported that, despite the large number of standards on survival equipment worldwide, immersion-related deaths remain the second-most-common cause of accidental death in children and the third in adults, with just under half a million deaths recorded in the year 2000. He explored some of the reasons for this. They include the fact that many people are inadequately prepared when they venture into the marine environment, and that people lack understanding of the hazardous responses associated with immersion in cold water. Unrealistic testing of immersion protective clothing and unrealistic expectations placed upon rescuers are also contributing factors.

The panel discussion on Developing a Construction Standard involved Peter Walsh, NMSC Standards Consultant; Rob Gehling, Principal Adviser — Technical to AMSA and President of the Australian Division of RINA; Glenn Cobb, Marine Business Manager, Lloyd's Register Australasia; and Mark Devereaux, Senior Adviser, Marine Safety Queensland.




Professor Michael Tipton (centre) compares notes on survival with Amanda Hinckley and George Hill at the Queensland Surf Lifesaving stand.
(Photo courtesy NMSC)

Construction standard discussion panel — Glenn Cobb (LR), Rob Gehling (AMSA and RINA), Peter Walsh (NMSC) and Mark Devereaux (MSQ)
(Photo courtesy NMSC)

The panel discussion on Standards and Training for Surveyors included Steven Beale of the Australasian Institute of Marine Surveyors, who reinforced the importance of Australia developing its own personnel rather than the "short term" fix of importing those with qualifications. A national training procedure for marine surveyors was recommended by Russell Behan from Maritime Matters. NMSC's Mori Flapan outlined how the NMSC was introducing a national approach for the survey of vessels through the National Standard for the Administration of Marine Safety (NSAMS).

Conference delegates in the Grand Ballroom
(Photo courtesy NMSC)

The AMSA Shipping Symposium, held for the first time at the Conference, attracted 200 delegates to discuss issues which traversed the boundaries between big ships and recreational boating. Issues discussed included transiting from State to AMSA Standards of Training Competency and Watchkeeping (STCW) qualifications, review of the Navigation Act, construction standards, the impact of the International Maritime Organization's environmental-protection regulations on smaller vessels, a national approach to the Automatic Identification System, and e-Navigation.

Site visits to the Gold Coast Marine Precinct to inspect boat manufacturers Riviera and Quintrex proved popular.

Site visit to Riviera
(Photo courtesy NMSC)

For more conference highlights visit www.nmsc.gov.au/msc2006_3.html.

## NSCV Construction Standard Builds for the Future

After a comprehensive lead-time in consultation, the drafting of the much-anticipated national marine construction safety standard and accompanying regulatory impact statement (RIS) is well in train.

NMSC is planning a series of workshops later this year to provide feedback on the final draft of the construction standard and the accompanying RIS. A reference group will also be formed to progress the draft standard to publication.

NMSC Senior Standards Consultant, Peter Walsh, presented a preliminary version of the draft National Standard for Commercial Vessels (NSCV), Part C Construction and Design, Section 3 Construction to the Marine Safety Conference on the Gold Coast in September.

Rob Gehling, Principal Adviser — Technical, AMSA, and President of the Royal Institution of Naval Architects (RINA) Australian Division, highlighted the fact that naval architects will be the main users of the construction standard. He favourably compared NMSC's process of drafting the new standard using national and international standards with the processes followed in other countries such as the USA and the UK.

The preliminary draft builds on outcomes of the 2004 Issues Paper for NSCV Part C, Section 3 Construction, which sought to replace several parts of Section 5 in the USL Code. It also included reference to AS 4132 Boat and Ship Design and Construction.

The issues paper explored the option of adopting ISO 12215 Small Craft (less than 24 m), Hull Construction and Scantlings, as well as using one or more classification society's rules and services. These options were canvassed at a stakeholder meeting held in Brisbane in late November 2004, where it was agreed that the classification society option should be explored and that ISO 12215 should be considered in restricted conditions.

After a thorough assessment of expressions of interest, Lloyd's Register's rules have been selected to provide the classification society rules and services component of the proposed solution.

If you would like to know more about the workshops, consultation process or the draft national standard for construction, then please contact the NMSC Secretariat on (02) 9247 214 or visit www.nmsc.gov.au. To view 'Construction Panel Discussion' presentations from the Marine Safety Conference 2006, visit www.nmsc.gov.au/msc2006_3.html.

## Compulsory Wearing of Lifejackets

Research now points to the view that personal flotation devices, or lifejackets (as they are commonly known), improve the safety of boaties out on the water and are absolutely critical in emergencies such as capsize or man-overboard situations. The *National Principles to Guide in Assessing Risks to Determine Policy on the Compulsory Wearing of PFDs* discussion paper aims to develop a national approach on this issue and was released by the NMSC at the Marine Safety Conference 2006.

"This is a chance for all those involved in boating to not only have their say on whether PFDs should be compulsory in certain situations, but what these situations are," explained NMSC CEO Ms Maurene Horder. According to NMSC data, 41 people died in Australian waters in 2005. Statistics on recreational boating fatalities from New South Wales, Tasmania, Queensland and Victoria from 2001–05 showed that 88% of those who died in a boating incident were not wearing a PFD.

Feedback is being sought on the principles and risks that may increase the likelihood of drowning whilst out boating:

- Principle 1 The nature of the activity
- Principle 2 The area of operation
- Principle 3 The environment
- Principle 4 Extra protection for inexperienced boaters
- Principle 5 Type and length of boat
- Principle 6 Propensity to take risks

Comment is also sought on which recreational boats should be excluded from PFD-wearing requirements and why.

Ms Horder took the opportunity to highlight the National Marine Safety Committee's Boat Safe Wear a Lifejacket for Openers education campaign — supported by Australian sporting icon, test cricketer Matthew Hayden. The 2006–07 summer boating campaign aims to raise awareness amongst Australia's boating community of the importance of wearing lifejackets.

Please go to www.nmsc.gov.au to provide feedback on the PFD discussion paper, which closes for public comment on 30 November 2006.

## NSCV Update

- The final draft of the National Standard for Commercial Vessels Part 1C Category F2 — Fast Craft has been approved by the NMSC for submission to the Australian Transport Council. The outcomes of the final stage of consultation and workshop can be viewed on the NMSC's website www.nmsc.gov.au; click on 'Have Your Say'.
- NSCV Section C6A — Intact Stability Requirements is now out for further public comment. This section was previously released for public comment, resulting in a large amount of comment being received. The result of the Reference Group's review of this comment is that the document has been restructured and the method of presenting the criteria altered significantly. This second public comment is sought on the updated subsection because of the degree to which it has been changed. It has been drafted so that it can be read as a self-contained presentation of criteria without the need to refer to test methods. The document is available for download from the NMSC's website, www.nmsc.gov.au, or in hard copy from the NMSC Secretariat by phone on (02) 9247 2124 or email secretariat@nmsc.gov.au. Public comment closes on 6 December 2006. [*The document was also circulated by RINA via email lists when released. If you have not yet done so, get your copy today and make comment, as this is what we will be living with for the foreseeable future!* — Ed.]
- NSCV Section C7B — Communications Equipment closed for public comment in September.
- NSCV Section C7C — Navigation Equipment also closed for public comment in September.

  These two linked sections, C7B and C7C, will now enter the next phase of drafting after consolidating stakeholders' comments.
- The discussion paper on *Possible Phase-out of HF (Voice) Monitoring of the Coastal Radio Network by 2010* has also closed for public comment and the NMSC will be convening its policy reference group to review the comments and make recommendations.
- NSCV Section C7D — Anchor and Mooring Equipment closed for public comment in October and will now enter the next phase of drafting after consolidating stakeholders' comments.

## NSAMS Update

The National Standard for the Administration of Marine Safety is being progressed:

- NSAMS Section 4 — Surveys of Vessels remains open for public comment.
- The public comment period for the draft NSAMS Section 5 — Auditing of Registered Training Organisations has closed for public comment and will now be prepared for final drafting.

## Public Comment

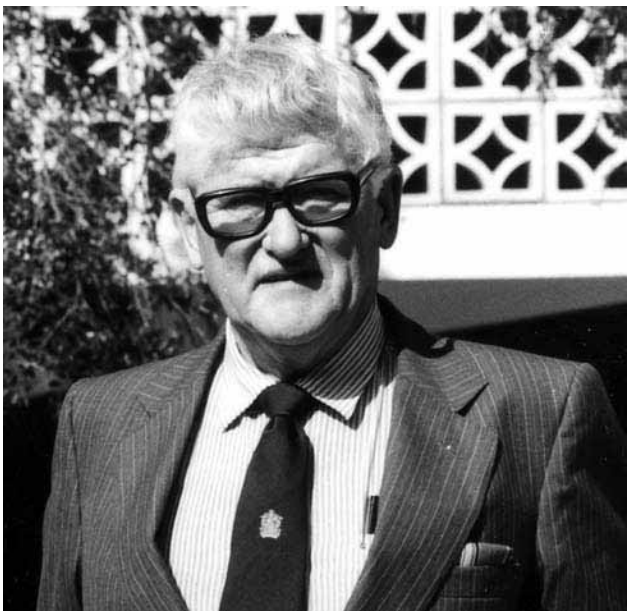
To view documents currently available for public comment, visit www.nmsc.gov.au, and click on 'Have Your Say'.

*Rosemary Prior*

# VALE ALAN MITCHELL

It is with sadness that *The ANA* records the passing of Alan Grafton Mitchell on 12 August 2006, aged 84 years. The funeral was held at the Northern Suburbs Crematorium and many of the elders of the tribe turned out for the service, including Noel Riley, Don Gillies, Laurie Prandolini, Bob Campbell, Keith Adams, Harry McGoogan and Captain Dick Humbley. The service was a celebration of Alan's life and included renditions of the *Skye Boat Song* and Rod Stewart's beautiful *Sailing* by Rachel Easton on violin and Edward Easton on cello. John Jeremy, the last Chief Executive of Cockatoo Dockyard where Alan spent much of his life, spoke at the funeral and his address is reproduced below.

*Phil Helmore*



Alan Grafton Mitchell OAM
15 June 1922–12 August 2006
(Photo John Jeremy collection)

## ALAN GRAFTON MITCHELL OAM

AGM. Alan Grafton Mitchell. One of the features of life today is the way initials are used to identify ourselves, our positions at work, or our organisations. It seems as if we no longer have time to write a name or describe something in full. However, it is often our initials that appear as a reminder of where we have been and what we have done.

I spend a great deal of time these days researching the minutiae of the history of the dockyard that was part of the lives of many of us here today — the dockyard on Cockatoo Island in Sydney. I am constantly coming across initials — reminders of the people who helped write the history of that remarkable island and, through their work there, contributed so much towards the development of this country.

Amongst those initials are two particular sets — DJM and AGM. DJM, David Mitchell was, of course, Alan's father. Born at Pyrmont in 1885, he started work on Cockatoo Island as an apprentice in 1904. He remained in the drawing office after he finished his time and, in 1933, when Cockatoo Docks & Engineering Company Limited leased the island, he became the company's naval architect for new construction, a role in which he continued until he retired in 1955. Fifty-one year's service — a mighty example for his son Alan to follow.

Alan Mitchell started work with Cockatoo Docks & Engineering Company as a cadet ship draughtsman on 2 January 1940 at the age of seventeen. It was World War II, and Cockatoo helped restart the Australian shipbuilding industry, built some very fine ships including the Tribal-class destroyers *Arunta*, *Warramunga* and *Bataan* and repaired many damaged allied warships. It must have been an exciting and challenging time for a young man.

Alan completed his apprenticeship in January 1945. Having partly completed study towards a Diploma in Naval Architecture at the Sydney Technical College, he left Cockatoo Dockyard in 1948 to go to Britain for further experience.

Between 1948 and 1951 he worked as a ship draughtsman with Vickers Armstrongs Limited at Barrow-in-Furness and then with J Samuel White & Co. Limited at Cowes on the Isle of Wight. Vickers were very busy then, building new passenger ships for the Australian run as well as completing warships begun during the war. At Cowes, Whites were building some of the new class of all-welded Daring-class destroyers, two of which had been ordered from Cockatoo for the RAN in 1946 and for which White's were supplying working drawings.

On 28 February 1945 an aircraft carrier was launched at Barrow and named *Majestic*. Laid up incomplete, *Majestic* was to become one of two aircraft carriers acquired for the RAN. Work resumed in 1949 to complete and modernise the ship — a task that turned out to be more difficult and protracted than expected.

Alan Mitchell returned to Vickers at Barrow-in-Furness in 1951 where he became the Assistant Shipyard Manager for the completion of *Majestic*. She was commissioned into the RAN as HMAS *Melbourne* in late 1955 and Alan Mitchell returned to Australia in her, arriving in May 1956. He left his new bride, Joan, behind — to find her own way to Australia as (in her own words) 'a £10 Pom'.

Alan then came back to Cockatoo Dockyard as Assistant Shipyard Superintendent, a position he held from May 1956 to September 1967. He occupied his time fitting out the second of the two Daring-class destroyers built at Cockatoo, HMAS *Vampire*, which was completed in June 1959. *Vampire* was a fine ship and Alan was, justifiably, very proud of her. He then turned his attention to the Type 12 frigates *Parramatta* and *Stuart*.

I first met Alan in the early 1960s when I was a young apprentice draughtsman. One of my earliest memories of him is during the construction of the roll-on roll off passenger ship, *Empress of Australia*, then the largest ship of her kind built anywhere in the world. The contract was a difficult one for the company, and Alan's task in an office on the top floor of the drawing office building was to find every possible claim for extra money and do his best to make them stick. It was tedious but essential work.

Alan moved on to become Materials Superintendent (from September 1967 to July 1975), and then Superintendent

of Dockyard Services (from July 1975 to April 1981). In this period the dockyard built the destroyer tender, HMAS *Stalwart,* and the destroyer escort, HMAS *Torrens*. It 1961 the dockyard started a continuous programme of submarine refitting, beginning with Royal Navy T-class and graduating to the RAN's Oberon-class submarines, the major task of the dockyard in its final decades.

From April 1981 until his retirement in June 1987, when HMAS *Success,* the last ship built at Cockatoo Island, was under construction, Alan worked as an assistant to the Senior Naval Architect for special projects.

I always found work at Cockatoo Island to be varied, interesting and challenging. I also felt it was undoubtedly worthwhile, a contribution to our country that lasts well beyond the completion of the last job. I believe Alan felt the same way.

When Alan retired in June 1987, he and his father had worked at Cockatoo Dockyard for a total of just over 99 years, a remarkable family contribution to the one dockyard and to the industry.

But it did not end there.

Alan was a Member of the Royal Institution of Naval Architects and, in 1970, he accepted the position of Honorary Secretary/Treasurer of the Australian Branch of the Institution.

In recognition of its 25th Anniversary in 1978, in 1979 the Australian Branch of the RINA became the first Division of the RINA — an event we celebrated with a major Symposium in Sydney. I was President at the time and Alan Mitchell was right at my side with all the support a President could ever need.

Alan Mitchell finally retired from his position of Honorary Secretary/Treasurer of the Australian Division of the RINA at the end of 1997. In his 27 years of service to the RINA and its members in Australia, Alan worked with seven Presidents, organised over 140 technical meetings, and made a major contribution to the management of some seven major symposia, usually in association with the Institute of Marine Engineers, The University of New South Wales and other related technical institutions.

Alan Mitchell's contribution to the management of the affairs of the RINA and its members in Australia, and to the Australian maritime industry has been exceptional. This contribution was made with devotion and patience and a considerable sacrifice of his time in employment and retirement. It was a great pleasure for his colleagues to see his service recognised in 1998 by the award of the Medal of the Order of Australia. It was richly deserved.

Alan's involvement with maritime matters was, however, not over. In 2000 he was invited by the Sydney Harbour Federation Trust to be a member of their Community Advisory Committee so that his knowledge of Cockatoo Island could help the Trust in its task of preserving the island, finding it a new role and interpreting its past for the benefit of future generations of Australians. Alan's contribution over the following six years was very helpful and of great value to the Trust.

In all stages of life, a time comes to move on. We all hope that in everything we do we have made a worthwhile contribution to the general good and left behind something of value to coming generations. Alan certainly did, and his family can be very proud of his part in the maritime history of Australia.

*John Jeremy*

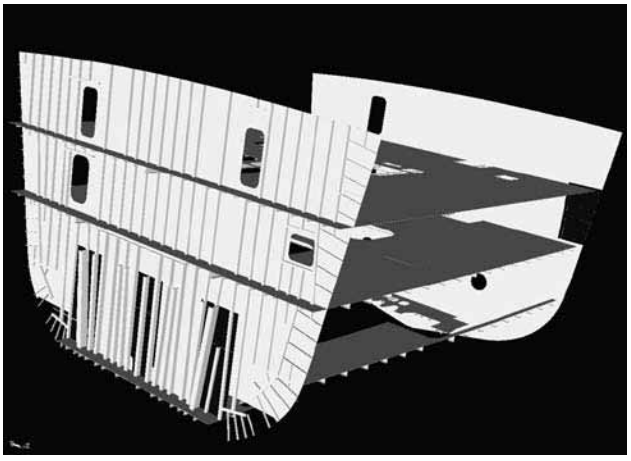
Joan and Alan Mitchell onboard *Vampire* in June 1999 for the celebration of the ship's fortieth anniversary
(Photo John Jeremy)

# INDUSTRY NEWS

## Martec and ShipConstructor® Partner for Integrated 3D Modeling, Design and Analysis of Ships

In October Martec Limited, developer of the Trident suite of structural analysis and seakeeping software, and ShipConstructor Software Inc., developer of the ShipConstructor suite of 3D product-modeling and production-planning software, officially announced a strategic partnership to combine the capabilities of their software products for the marine industry. The ShipConstructor user community will soon be able to easily conduct detailed finite element stress, hydrodynamic and other specialised analyses in Trident, directly from existing ShipConstructor models. The combined ShipConstructor and Trident system will create a powerful, integrated solution for 3D modeling, design and analysis of commercial and naval vessels.

"Martec's arsenal of analysis software specifically designed for ship structures is an excellent complement to ShipConstructor's 3D product-modeling and production-planning software," commented Darren Larkins, Chief Software Architect at ShipConstructor Software Inc.



A ShipConstructor DDROM structure model viewed in Martec's Trident analysis software

Leading ship designers, owners and operators are seeking software tools that extend ship-modeling applications beyond design and construction to include complete lifecycle management of the vessel. Doing so will eliminate the time-consuming and costly production of separate analysis models required as input to the growing number of lifecycle maintenance-analysis tools. This offers significant savings in operation and maintenance costs as well as improved understanding and confidence in vessel safety.

"With our combined solution, ship designers and naval architects will no longer need to rebuild models of their vessel to conduct engineering analysis," said David Brennan, Manager of Martec's Trident Group. "Users of the integrated Trident-ShipConstructor system will save valuable time during the initial design of a vessel and throughout its lifecycle." Martec has joined the ShipConstructor Developer Network (SCDN) program, which provides technical resources and support for integrating with ShipConstructor.

Martec's Trident Group has established the company as a leader in the field of naval architecture and marine-engineering technology and services. Martec's extensive research-and-development experience in the technology challenges specific to the maritime industry which has resulted in the development of the Trident suite of structural- and seakeeping-analysis software for naval and commercial vessels. Developed in partnership with Defence Research and Development Canada (DRDC), Trident software is used today by navies, ship registries, shipyards, naval architects and ship designers around the world.

ShipConstructor is the number one AutoCAD-based marine 3D product-modeling and production-planning software suite in the world and the development and recent release of ShipConstructor 2006, encompassing the ground-breaking Database Driven Relational Object Model™ (DDROM™), or simply SmartParts™, technology, continues their leading-edge history and provides a platform for future innovation and expansion. ShipConstructor's single-database concept supports all operations from project inception through to decommissioning of the vessel and promotes cooperation and collaboration between individuals, departments and organizations, ensuring that mission-critical information is available when needed.

## Maxsurf Software Upgrade

Formation Design Systems has announced the Version 12 upgrade to the Maxsurf suite of naval architecture software. Used by over 1000 naval architects and shipbuilders worldwide, Maxsurf provides a comprehensive suite of tools for all types of ship and boat design. Key features include -

- Advanced 3D NURB surface modeling with dynamic trimming.
- Complete suite of stability, strength, resistance and motion prediction tools.
- Renowned graphical Windows interface.
- Smooth data exchange to and from Rhino, AutoCAD, Word, Excel and other systems.
- Data transfer to ShipConstructor for detailing, piping, HVAC and production.

The new features in Version 12 of Maxsurf will help all naval architects, no matter what type of vessel they design. The new features include -

- Bi-directional data exchange with Rhino.
- Expanded Automation/VBA/Macro support.
- Enhanced hullform parametric transformation.
- Automated generation of girth expansions and stringer plots.
- Enhanced criteria for heeling arms, and more.

## Higher-efficiency engine with Ultra-low Emissions for Ships

The two world-leading European marine engine manufacturer companies, MAN Diesel and Wärtsilä Corporation have agreed to propose a large-scale Cooperative Research Project — HERCULES-B. The target is to maximize fuel efficiency in parallel to emissions reduction.

The principal aim in HERCULES-B is to improve efficiency of marine diesel propulsion systems to a level of more than 60% and, hence, to reduce fuel consumption and $CO_2$ emissions substantially. An additional concurrent aim is towards ultra-low exhaust emissions from marine engines by the year 2015. Today diesel propulsion systems power 99% of the world fleet.

HERCULES-B is a large innovative research-and-development project aiming for technological breakthrough in the reduction of fuel consumption and emissions for the next-generation marine diesel engines onboard ships, reaching beyond today's limits set by the IMO and radically improving the environmental effect of waterborne transport.

The project will deliver a number of Technology Demonstrator engines, operating with improved efficiency and reduced emissions. Certain new technologies developed will be validated onboard new-built ships.

The HERCULES-B Project is planned to run over a four-year period with a targeted budget of €60 million. The project is expected to be fully agreed in 2007 and subsequently proposed for funding within the Framework Program 7 (FP7, Theme Transport) of the European Commission.

## Wärtsilä engines for Royal Caribbean Cruises

Wärtsilä Corporation won an order in August to power a new post-Panamax cruise ship contracted by Royal Caribbean Cruises Ltd (RCCL) for its Celebrity Cruises brand at Meyer Werft in Papenburg, Germany. With this order included, Wärtsilä will now be powering the whole series of three new post-Panamax cruise ships contracted by RCCL at Meyer Werft during 2006. The other two contracts were awarded to Wärtsilä in spring this year.

Each ship will be equipped with four 16-cylinder Wärtsilä 46 engines having a combined power of 67 200 kW. The engines will be arranged in a diesel-electric power plant, supplying all propulsion and electrical requirements of the vessel.

The Wärtsilä engines will be equipped with common-rail fuel injection systems. The common-rail systems ensure that the engines have no visible smoke at any power level, while also meeting international regulations for NOx emissions.

The ships are of a new class of 117 000 grt cruise ships which are able to carry 2850 passengers in 1425 cabins. They will be 315 m long overall with a beam of 36.8 m. The first two ships will be named *Solstice* and *Equinox*, and will be delivered from autumn 2008 onwards.

**Order for retrofits in eight cruise ships received in spring**

In addition, RCCL has chosen Wärtsilä diesel engines for retrofitting in eight cruise ships of Celebrity Cruises and Royal Caribbean International. This order was received in spring this year. The new engines will give RCCL better fuel economy while meeting all environmental requirements for air emissions.

The eight ships concerned are the Millennium-class ships of Celebrity Cruises and the Radiance-class ships of Royal Caribbean International, all being of 91 000 grt and carrying 2000 passengers. Each ship has a 58 MW power plant, based on gas turbine-driven generating sets for propulsion and all other electrical requirements on board.

The ships will now each be fitted with an additional 11.2 MWe generating set powered by a 16-cylinder Wärtsilä 38 engine. Wärtsilä will deliver the complete Wärtsilä 38 generating sets in Vee-form configuration with required ancillary equipment. The new generating sets will provide base load power for the ships. The low fuel consumption of the Wärtsilä 38 engines and their use of heavy fuel oil will thus significantly improve the ships' fuel economy. The generating sets will be installed starting from 2007 onwards.

Wärtsilä contracted a total of 20 engines for RCL cruise ships in 2006. Wärtsilä Corporation has booked orders so far in 2006 to supply a total of 20 environmentally-sound diesel engines with a combined power of more than 358 MW to Royal Caribbean Cruises Ltd (RCCL) for installation in 11 cruise ships, both newbuildings and retrofits. The value of all these orders is more than €50 million.

## Wärtsilä to power Project Genesis cruise ship

Wärtsilä Corporation received a contract from Aker Yards Oy, Finland, in July 2006 for the delivery of the main engines and the transverse tunnel thrusters for the 220 000 grt Project Genesis cruise ship contracted by Royal Caribbean Cruise Ltd (RCCL) for operation by Royal Caribbean International.

Due for delivery in autumn 2009, this cruise ship will be powered by six Wärtsilä 46 commonrail diesel engines. The engines will be incorporated in the ship's diesel-electric power plant supplying all propulsion, ancillary and hotel services. Wärtsilä is also supplying four Lips transverse tunnel thrusters.

The Project Genesis vessel is a huge leap in size, being some 43 per cent larger than RCL's record-breaking *Freedom of the Seas* delivered earlier this year by Aker Yards. The 160 000 grt *Freedom of the Seas* is the latest of a long line of RCCL cruise ships powered by Wärtsilä diesel engines. These include four delivered from France in 1995–1998, and five Voyager-class ships from Finland in 1999–2003 in addition to several earlier deliveries.

## Wärtsilä Power System for Multi-Purpose Floater

In August Wärtsilä was awarded a contract from MPF Corp. Ltd to deliver a total power system for a Multi-Purpose Floater, the MPF 1000 offshore drilling vessel. The MPF is planned to be completed and delivered from Dragados Offshore SA, Spain in the fourth quarter of 2008. The contract involves detail design, products, systems and commissioning of the power plant, propulsion, electrical and automation systems. Delivery of the major components will be during the first quarter of 2008. The value of the deal is over €50 million.

"To deliver a total integration of power plant, power distribution, automation and propulsion systems for one of the first vessels which combine drilling and FPSO capabilities, our systems will ensure maximum performance, environmental friendliness and optimal lifecycle benefits

both for the owner and the operator", said Magnus Miemois, Vice President of Wärtsilä Ship Power Solutions business. "Wärtsilä has over time been committed to MPF Corp. during various project stages with an influential and convincing understanding of our needs, and we are happy to conclude with Wärtsilä as one of the main sub-contractors for our Multi-Purpose Floater" says Tore Nedregaard, President and COO of MPF Corp.

**Total power system from Wärtsilä**

Wärtsilä will deliver eight 16-cylinder Wärtsilä 32 diesel engines with a combined power output of 58 880 kW, generators, medium-voltage switchgear, low-voltage distribution boards, frequency converters, safety and automation systems (including emergency shut-down, fire and gas, power management, vessel automation), a DP3 dynamic-positioning system, thruster control and information-management systems. Wärtsilä's own frequency converter technology became part of Wärtsilä's product portfolio in conjunction with the acquisition of Wärtsilä Automation Norway. The systems will mainly be delivered as complete, fully-equipped factory-tested modules.

**MPF 1000 combines floating production and drilling**

The MPF 1000 is the largest and most versatile offshore drilling unit ever built. The vessel gives the oil companies a new tool in the exploration and development phases of offshore oil and gas fields. The MPF 1000 can combine floating production, storage and offloading with drilling. It is designed for simultaneous drilling and production in deep waters and harsh environments, including ultra-deep water. The vessel is 290 metres long and has storage capability of one million barrels of oil.


Wärtsilä will deliver a total power system for the Multi-Purpose Floater, the MPF 1000, which is the largest mobile drilling unit ever built
(Image courtesy Wärtsilä)

## The World's Most Powerful Engine enters Service

The world's first 14-cylinder low-speed engine entered service on 1 September 2006 in a large, fast container vessel. Developed by Wärtsilä Corporation, the 14-cylinder Wärtsilä RT-flex96C engine is also the world's most powerful engine with an output of 80 080 kW at 102 rpm.

The 14-cylinder Wärtsilä RT-flex96C engine is a major breakthrough for ship propulsion. It extends the power available to suit the new generation of large containerships while combining the benefits of proven, reliable engine designs with the complete flexibility of RT-flex common-rail technology.

Traditionally, low-speed marine engines have been built with a maximum of 12 cylinders. However, when it was recognised some years ago that container ships envisaged would need more than was available from existing RTA96C and RT-flex96C low-speed engines, a solution was found to extend the engine power range to 80 080 kW by offering also 13- and 14-cylinder engines.

The 14-cylinder RT-flex96C is thus based on an already well-established 12-cylinder RT-flex96C design, which itself was developed from the RTA96C engine type, widely applied in container ships since 1998. It thus benefits from the wealth of service experience with engines of the same type. To date there are more than 300 RT-flex96C and RTA96C engines in service or on order worldwide.

**Adaptation for 14 cylinders**

Extensive consideration was nevertheless given to the practicality of the increased numbers of cylinders and to ensure that the engines match everyone's expectations in terms of safety, reliability and durability.

With regard to the engine structure, the opportunity had already been taken, when adapting the RTA96C engine type, to accommodate the RT-flex common-rail system to introduce certain modifications in all cylinder numbers for better manufacture. These changes also resulted in greater stiffness and reduced stresses in the structure. The revision also took into account the 14-cylinder engines to ensure that they had adequate structural strength and rigidity without further modification.

The crankshaft of the RT-flex96C has sufficient torque capacity for 14 cylinders, the material having been upgraded to enable an increased shrink fit for a greater design margin. The thrust bearing structure in RT-flex96C engines with a mid-gear drive has been revised to reduce deformations and stresses even with the increased thrust in the 14-cylinder engine when the vessel is equipped with a shaft motor.

**Wärtsilä RT-flex common-rail system**

The fully electronically-controlled Wärtsilä RT-flex common-rail system of the 14-cylinder engine brings important benefits to shipowners. It gives unrivalled flexibility in the way the engines operate, resulting in smokeless operation at all operating speeds, lower fuel consumption, reduced maintenance costs and lower steady operating speeds for better manoeuvring. The RT-flex system also has the potential for adaptation to future needs.

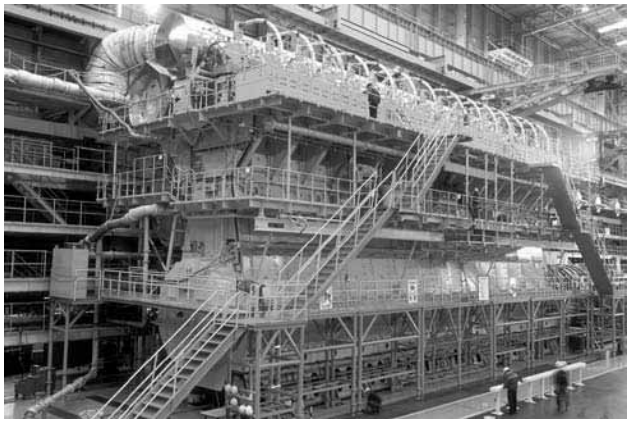
A visual feature of the 14-cylinder RT-flex96C is the modest size of the compact supply unit compared with the overall dimensions of the engine, and the absence of the full-length camshaft usual in mechanically-controlled engines. The supply unit with its fuel and servo oil-supply pumps is on the engine side, at the mid length on a mid-gear drive. There are two identical rail units, each for seven cylinders, along the side of the cylinder tops.

**High-efficiency waste heat recovery**

An important feature of the first ship installation of the 14RT-flex96C is the high-efficiency waste-heat recovery system. It contributes major savings in fuel consumption and reductions in exhaust-gas emissions.

Exhaust gases of the ship's main engine pass through an

exhaust-gas economiser to generate steam for a turbine-driven generator. The turbogenerator set also includes an exhaust-gas power turbine driven by a portion of the exhaust gases diverted from the main flow through the engine's turbochargers.



The first 14-cylinder Wärtsilä RT-flex96C marine engine is 27.3 m long and 13.5 m high and has an overall weight of 2300 tonnes (Photo courtesy Wärtsilä)

This high-efficiency waste-heat recovery plant can provide an electrical output of up to about 12% of the main engine power. The generated electricity is supplied to the ship's main switchboard and employed in a shaft motor to assist in ship propulsion. A portion of the steam from the exhaust economiser is utilised in shipboard heating services.

Energy recovery is maximised by adapting the engine to the lower air-intake temperatures that are available by drawing intake air from outside the ship (ambient air) instead of from the ship's engine room. The engine turbochargers are matched for the lower air-intake temperatures, thereby increasing the exhaust energy without affecting the air flow through the engine. There is thus no increase in the thermal loading of the engine and there is no adverse effect on engine reliability.

## Wärtsilä invests in Steerable Thruster Manufacturing in China and the Netherlands

In November the Wärtsilä Corporation announced that it will invest in the manufacture of steerable thrusters in China and the Netherlands. The investment value is €8.7 million. In China, Wärtsilä will invest in the machinery and assembly equipment for the manufacturing of Lips Compact Thrusters in the Wuxi factory. This will allow the transfer of the assembly of such smaller-type thrusters from the Netherlands to China during 2007.

In Drunen, the Netherlands, the investment will cover an assembly hall including tooling for the larger Lips Modular Thrusters for offshore applications. The investment will thus enable the Drunen factory to focus on the large thrusters.

The investment will support the expectations for growth in the market. Wärtsilä, for example, is gaining an increasing number of orders from the offshore industry for propulsor units to be supplied to semi-submersible rigs and drill ships, as well as pipe-laying and heavy-lift vessels. There is also growth in the numbers of supply and support vessels and offshore terminal tugs to be equipped with Wärtsilä propellers.

The new capacity in China and the Netherlands will come into production by mid 2007.

The classic Australian southery buster seems to have been rare on the east coast of Australia in recent years — but not this season! On Sunday 8 October the Sydney Amateur Sailing Club's Sunday series was interrupted by a clear-sky southerly change — fortunately before the start (the race was abandoned). Competitors scuttled for home or shelter as the wind grew to 40 knots within minutes. The crew of two in the Ranger-class gaffer *Vanity* (pictured), owned by Sydney architect John Crawford, enjoyed a spectacular ride home. *Vanity* recorded 9.1 knots over the ground and has accordingly claimed the Ranger-class World Water Speed Record!
(Photo John Jeremy)

# PRIMARY CASUALTY RECEPTION IN THE RAN

Health support is an important consideration in any joint or combined operation. From a practical perspective, health support, both preventative and therapeutic, exists to conserve the fighting strength of the forces, ultimately contributing to the maintenance of operational capability and the success of the mission. Health support is also influenced by Australian societal expectations that injured members of the armed forces will have access to competent medical care from the time of injury until completion of the rehabilitation process.

The level of health support provided to any Australian Defence Force (ADF) activity is based on a hierarchical system of casualty management (from Level One to Five) [1] that may be affected by numerous factors, including the nature of the activity itself, weapon systems and other technologies, medical and physical fitness of the force, emerging disease patterns, the availability of other ADF health services and evacuation assets, and the extent and availability of civilian health infrastructure. It is a principle of health support that no patient should be evacuated further than their physical condition requires, and the provision of health-support facilities as far forward as tactically possible helps to ensure that the treatment and evacuation process remains continuous and rapid.

An established Primary Casualty Reception Facility (PCRF) comprising a Level Three [2] health capability, when deployed in a ship enables the early treatment of casualties afloat. A PCRF is only activated in anticipation of casualties and allows a 'window of opportunity' to effectively treat an injured member prior to the establishment and securing of health provision ashore. Operational planning may incorporate a reduction in levels of health logistic support ashore where an Afloat Level Three Medical Facility (AMF) is in the Area of Operations (AO). Importantly, the presence of such a well-equipped and safe AMF in the AO also assists in the maintenance of troop and crew morale.

The capacity to make available surgery and post-operative support in the AO also limits the requirement for dedicated platforms and personnel to perform strategic aeromedical evacuation (AME) [3]. Recent experience in Iraq (Operations Iraqi Freedom and Enduring Freedom) has shown that the majority of wounded soldiers can be medically evacuated to definitive care, using helicopters for forward AME, within half an hour of initial injury [4].

In December 1993, the Australian Government approved the purchase of two United States Navy Newport-class Landing Ships Tank, which were commissioned as HMA Ships *Kanimbla* and *Manoora.* The ships underwent extensive conversion to meet the requirement for a joint amphibious capability, including the fitting of dedicated communications and operations facilities to support tactical commanders, a hangar and flight decks capable of supporting up to four Army Black Hawk or three Navy Sea King helicopters, and two Army landing craft. Now classified as amphibious transports (LPA), the primary military role of each LPA is to transport, lodge ashore and support an Army contingent of 450 troops, their vehicles and equipment. In addition, they also contribute to a range of constabulary and diplomatic tasks, including peacekeeping operations, the protection and evacuation of Australian nationals within the region in the event of serious civil disturbance, and support disaster relief operations both within Australia and the region [5].

A fully-equipped PCRF is an intrinsic capability in both vessels, incorporated in response to an anticipated increase in the need for the ADF to participate in a broad range of national and international tasks, and to provide medical support for them. The PCRFs aboard *Kanimbla* and *Manoora* consist of a Casualty Reception Area located forward of the hangar; a modern Operating Theatre; an eight-bed High Dependency Unit, with two of those beds able to be utilised as Intensive Care beds; a 36-bed Low Dependency Unit and X-ray and pathology equipment; and dental services can be provided when required. Casualties are usually accepted by helicopter, but sea transfer can also be used if necessary.

The PCRF in HMAS *Kanimbla*
(RAN photograph)

Staffing is determined using a modular capability system. Medical capability elements which can be deployed include AME, resuscitation, primary health, intensive care, operating theatre, and command teams. Depending on the level of activation, up to 67 personnel will join the LPA, reducing troop carrying capacity by the same number.

The PCRF, although located adjacent to the ship's sickbay, is considered a separate entity, so the ship's Senior Medical Sailor manages the routine medical care of the ship's company. To prevent deterioration of costly medical equipment and unit infrastructure when not activated, the facilities are each permanently staffed with a RAN Nursing Officer responsible for sourcing and maintaining the equipment and medical stores. This ensures that the facilities are ready for rapid activation when required.

A shore-based Operations Cell, which reports formally through the Amphibious and Afloat Support Force Ele-

ment Group (AASG), supports the Nursing Officer. Logistic support for the PCRFs, when activated, is significant, and the vital components of a functioning medical facility are all provided, including waste disposal, laundry requirements, medical gases, drugs, and cleaning and sterilising agents. The PCRF maintains sufficient consumable stores at all times to provide care to a significant number of personnel for approximately five days. This provides adequate lead-time to re-supply should the activation be extended or conflict escalate, and for other appropriate contingency measures to be put in place.

Balmoral Naval Hospital (BNH) provides the majority of personnel to fill PCRF billets when the facility is activated. The staff complement of the PCRFs is also augmented from time to time by active tri-Service specialists, usually orthopaedic or general-surgery specialists and anaesthetists. In circumstances where only one PCRF has been activated, the Medical Officer in Charge (OIC) of BNH assumes the role of OIC PCRF for the duration of the operation wherever possible.

As a relatively new RAN capability, all aspects of the PCRF have matured and have been further developed through operational experience. The PCRF Operations Cell was established formally in 2003 and provides dedicated personnel to examine logistic and personnel aspects of the units as their primary role, and to action recommendations from post-exercise/deployment reports. This cell moved from BNH under the OIC BNH to the AASG under the Capability Delivery section in October 2005.

Early lessons learned invariably focussed on equipment, logistic supply of consumable items, and a lack of allocated space to perform casualty triage. No medical equipment on board was specifically marinised and certain adaptations have been required to ensure safety of the equipment in a moving environment. Various methods of logistic supply have been investigated as management of medical consumables, often with a short shelf life, absorb considerable time and are better handled by personnel with medical knowledge. Ship's Operating Procedures were required to detail the dual functionality of the hangar space to ensure that both medical and aviation requirements could be met.

The LPAs have substantially boosted the RAN's amphibious, logistic and training capabilities and provided the first deployable Level Three medical capabilities since the decommissioning of the aircraft carrier, HMAS *Melbourne,* in 1982. The PCRFs have contributed significantly to the ability of the ADF to respond to national and regional commitments either independently, or as an element of combined operations.

From the first activation during Operation GOLD for the 2000 Olympics, the PCRF has been utilised in numerous major deployments since, including for combat operations in Iraq and Afghanistan (Operations Catalyst and Slipper), in peacekeeping operations in the Solomon Islands (Operations Anode and Trek), in border protection (Operation Relex) and, most visibly, in humanitarian assistance in the wake of the Indonesian tsunamis and earthquakes in early 2005 (Operations Sumatra Assist I and II). Foreign nationals have been treated on board on two occasions (Operations Relex and Sumatra Assist I/II) [6]. Most patients, however, have been ADF personnel who have been treated, stabilised and medically evacuated to definitive care ashore, or returned to duty.

The utility of the PCRF and its proven efficacy in boosting medical capability in various operational environments, demonstrated once more during the recent deployment of HMAS *Kanimbla* to East Timor for Operation Astute [7], has led to a similar requirement being identified in the planned acquisition of the two new RAN amphibious ships (LHDs) from 2012.

**References**


1. *ADF Publication 53, Health Support,* Defence Publishing Service, Canberra, 1998, pp. 1-1 & 1-2.

2. A Level Three facility is staffed and equipped to provide resuscitation, initial surgery and post-operative treatment. Care at this level may be the initial step towards restoration of functional health as distinct from procedures which stabilise a condition or prolong life; *ADFP 53, Health Support,* p. 1-1.

3. Strategic AME is that phase of evacuation that provides airlift for patients out of the AO; *ADFP 53, Health Support,* Glossary.

4. Forward AME is that phase of evacuation that provides airlift for casualties, from the battlefield to the initial point of treatment within the AO; *ADFP 53, Health Support,* Glossary.

5. Royal Australian Navy, *The Navy Contribution to Australian Maritime Operations,* Defence Publishing Service, Canberra, 2005, pp. 104-8.

6. Royal Australian Navy, *Database of Royal Australian Navy Operations, 1990-2005,* Working Paper No. 18, Sea Power Centre — Australia, Canberra, 2005; and 'Operation Sumatra Assist Two', *Goorangai,* Occasional Papers of the Royal Australian Naval Reserve Professional Studies Program, Volume 2, Number 1, April 2006.

7. Royal Australian Navy, 'Operation Astute — the RAN in East Timor', *Semaphore,* Issue 12, June 2006.



*Reproduced from* Semaphore*, Issue 15, 2006, published by the RAN Sea Power Centre — Australia.*

# MEMBERSHIP

## Australian Division Council Meeting

The Australian Division Council of RINA met on Wednesday 20 September 2006 with teleconference links to all members and the President of the Division, Mr Rob Gehling, in the chair.

Matters, other than routine, which were discussed, included:

**Senate Inquiry into Naval Shipbuilding in Australia**

The President reported that he and Mr Jeremy had appeared before the Senate Sub-committee during its hearing in Sydney, where they answered questions raised in connection with the Division's submission. It was unfortunate that, due to an oversight by the committee secretariat, a supporting document prepared some time ago by the Division for the 2000 Defence Review, had not been made available to members of the Senate Sub-committee. Matters raised during the hearing were mainly on clarification of statements contained in the submission.

**RINA/EA Agreement of Cooperation**

Council considered and agreed to a final draft of the response to the document prepared by Engineers Australia to replace the existing memorandum. The final draft had been prepared following input from Council and the Chief Executive of RINA and will now be forwarded to Engineers Australia for their comments before it returns to Council for final approval prior to signing by the President on behalf of RINA.

**Accreditation of UNSW Engineering Courses**

The Division's representative on the Engineers Australia University Accreditation Panel reported on the panel's visit to The University of New South Wales. He was impressed by the attention given to RINA's presence on the panel and the degree of importance placed on the component of naval architecture in course material.

**Boat Surveys**

The WA Section had asked Council for its view on the question of naval architects in the role of surveys for pleasure craft. Council believed this was a matter for naval architects to consider individually, bearing in mind that there are no statutory regulations governing the survey of pleasure craft and the rigorous standards in place for the survey of commercial vessels. It was noted that the requirement for survey of pleasure craft is usually between the insurer of the craft and the owner, and members should be aware of their legal liability if they offer their services for survey of pleasure craft and of the necessity to have adequate professional indemnity insurance.

**Naval Architects and Project Management**

Council was made aware of moves within the Defence Materiel Organisation (DMO) of the Department of Defence proposing to set up a formal register of those engaged in project management. As many naval architects have a responsibility in project management, it was decided to set up, as a matter of urgency, a Project Management Sub-committee of Council to examine the question of project management and its implications for naval architects. The Sub-committee is to report its findings to the next meeting of Council.

The next meeting of the Council of the Australian Division is scheduled for Wednesday, 13 December 2006.

*Keith Adams*
Secretary

## Walter Atkinson Award 2005

No nominations were received for the Walter Atkinson Award for 2005 and, consequently, no award has been made.

## New Corporate Partner

The Institution recently welcomed Sinclair Knight Merz (SKM) as a new Corporate Partner in Australia.

## Neil Cormack's Papers

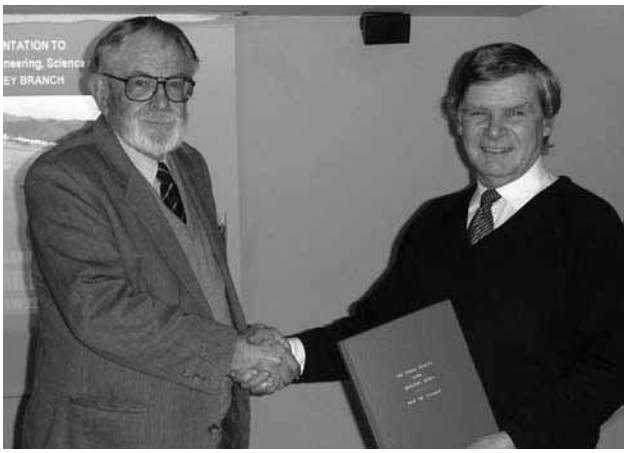
Neil Cormack has recently collected the papers he has published over the years and had eight numbered copies bound as *On Tuna Boats and Sailing Ships* and presented to various institutions. Copy 4 was presented to the Australian Division of the Royal Institution of Naval Architects for inclusion in the Division's library.

Among the papers are the following:

- Cormack, N. (1968), On the Building of Two Wooden Tuna Vessels in South Australia, The Royal Institution of Naval Architects (Australian Division).
- Cormack, N. (1997), The Four-masted Barques *Herzogin Cecile* and *Pommern*, The Royal Institution of Naval Architects (Australian Division), 28 May.
- Cormack, N. (2002), The British Barque *Garthneill* ex *Inverneill*: Hydrostatic and Stability Data.
- Ghys, N. and Cormack, N. (2004), An Investigation into the Loss of the Steel Bark *Admiral Karpfanger* ex *L'Avenir*, *Marine Technology*, Society of Naval Architects and Marine Engineers, Jersey City, October.

The presentation was made by Phil Helmore, on behalf of Neil Cormack, to the Secretary of the Australian Division, Keith Adams, at the technical meeting of the NSW Section on 11 September. The bound copy has been placed in the Barker Memorial Library of the Australian Division, which is now housed as part of the UNSW Library collection.

*Phil Helmore*



Keith Adams receiving Neil Cormack's book
*On Tuna Boats and Sailing Ships* from Phil Helmore
(Photo courtesy Graham Taylor)

# NAVAL ARCHITECTS ON THE MOVE

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

Ben Adamson, a graduand in naval architecture from the Australian Maritime College, has taken up a position with Austal Ships in Fremantle.

Bronwyn Adamson, after travelling through the US and sailing in south-east England, has taken up a position as Second Engineer on *Ocean Victory*, a 47 m motor yacht, based in the south of France for the winter.

Tristan Andrewartha, a graduand in naval architecture from the Australian Maritime College, has taken up a position with the Maritime Platforms Division of the Defence Science and Technology Organisation in Melbourne.

Daniel Atkins, a graduand in ocean engineering from the Australian Maritime College, has taken up a position with Clough Oil & Gas in Perth.

Nick Barratt has moved on from Austal Image and has taken up a position with Gibbs & Cox in Adelaide.

James Barton, a graduand in naval architecture from the Australian Maritime College, has taken up a position with Tenix Marine in Williamstown, Vic.

Justin Bentink, a graduand in naval architecture from the Australian Maritime College, has taken up a position with Austal Ships in Fremantle.

Nick Billett has moved on from Blackline Shipping and has taken up a position with SeaLife Designs in Brisbane.

Grahame Boyle, a graduand in ocean engineering from the Australian Maritime College, has taken up a position with Technip Oceania in Perth.

Grant Brunsdon has moved on from Austal Ships and has taken up a position with Clough Oil & Gas in Perth.

Ross Burchill has moved on from NQEA Australia/AIMTEK and has taken up a position with Gibbs & Cox, working for the AWD Evolved Team at the Air Warfare Destroyer Systems Centre in Adelaide.

David Cox has moved on from the Centre for Maritime Engineering and has taken up the position of Chief Design Engineer for the Amphibious and Afloat Support System Program Office of the Department of Defence in Sydney.

Dan Curtis has returned from the position of ANLO Bristol in the UK, and has taken up the position of Assistant Director Platform Performance for the Directorate of Navy Platform Systems of the Department of Defence in Canberra.

Ed Dawson, a graduand in naval architecture from the Australian Maritime College, has taken up a position with BMT Defence Services in Melbourne.

Goran Dubljevic has moved on from Logistics Technology International and has taken up a position as a naval architect with Sinclair Knight Merz at their Armadale office in Melbourne.

Jay El-Atm, a graduand in naval architecture from the Australian Maritime College, has taken up a position with Austal Ships in Fremantle.

Geoffrey Fawcett has moved on within the American Bureau of Shipping organisation and has taken up a position as a surveyor in Dubai, United Arab Emirates.

Lee Fennell has moved on from Austal Ships and has taken up a position with SWG Offshore in Perth.

Steve Fitzsimmons has moved on from Austal Ships and has taken up a position with Technip Oceania in Perth.

David Gosling has moved on from the NSW Maritime Authority and has taken up a position as a Surveyor with Det Norske Veritas Classification in Sydney.

Tim Hall has moved on within Lloyd's Register Asia, and has taken up the position of New Construction Product Leader in the Korea Management Office, Busan, Republic of Korea.

Danielle Hodge, a graduand in naval architecture from the Australian Maritime College, has taken up a position with the Defence Materiel Organisation in Canberra.

Peter Holmes has moved on from Perry Catamarans and has taken up a position as a naval architect with Clubb Drafting Services in Brisbane.

Mark Hughes' position at Gibbs & Cox is Director Regulation Safety and Risk (rather than as a naval architect, as reported in the August 2006 issue of *The ANA*) for the AWD Evolved Team in the Air Warfare Destroyer Systems Centre in Adelaide.

Joel Ireland, a graduand in ocean engineering from the Australian Maritime College, has taken up a position with SubSea7 in Stavanger, Norway.

Tegan Kay, a graduand in ocean engineering from the Australian Maritime College, has taken up a position with JP Kenny in Perth.

Geoff Leggatt has moved on from Austal Ships and has taken up a position as Senior Naval Architect with Arup in Perth. Arup's energy group focuses on oil and gas, and they are expanding their Perth Office to incorporate naval architectural capabilities.

Nigel Lynch has moved on from One2three Designs and has taken up a position as a Plan Approval Engineer with Det Norske Veritas in Sydney.

Murray Makin has moved on within the Thales Australia, Naval, organisation and has taken up the position of Manager Marine Business Development at Garden Island in Sydney.

Lance Marshall continues as a naval architect with Sinclair Knight Merz, but has moved from the Williamstown office to their Armadale office in Melbourne.

Cameron Nilsson-Linne has moved on from Austal Ships and has taken up a position with GeoSubSea in Perth.

Simon Orr has moved on Australian Marine Technologies, and four months' secondment to Gibbs & Cox in Adelaide working on the Evolved AWD, and has taken up a position as a naval architect in Ship Design and Engineering Services for Thales Australia, Naval, at Garden Island in Sydney.

Thuy Sy Phan has completed his PhD degree at Southampton University in England and has taken up a position as a plan appraisal surveyor with Lloyd's Register Asia in Singapore.

Mitchell Pike, a graduand in naval architecture from the

Australian Maritime College, has taken up a position with Acergy in Perth.

Chris Polis has moved on from Scientists Engineers Managers and Facilitators in Launceston and has taken up a position with Gibbs & Cox in Adelaide.

John Polmear, a graduand in naval architecture from the Australian Maritime College, has taken up a position with Austal Ships in Fremantle.

Michael Ray, a graduand in ocean engineering from the Australian Maritime College, has taken up a position with SubSea7 in Stavanger, Norway.

Adam Solomons has moved on from Mammoet and the Alcan Gove project in Brisbane and has taken up a position with London Offshore Consultants Australia in Perth.

Jason Steward has moved on from ADI Limited and Thompson Marconi and has taken up a position with Gibbs & Cox, working for the AWD Evolved Team at the Air Warfare Destroyer Systems Centre in Adelaide.

Mitchell Stone, a graduand in ocean engineering from the Australian Maritime College, has taken up a position with McDermotts in Perth.

Peter Swain has moved on within the Thales Australia, Naval, organisation and has taken up the position of Manager Naval Architecture in Ship Design and Engineering Services at Garden Island in Sydney.

Dash Swift, a graduand in ocean engineering from the Australian Maritime College, has taken up a position with Acergy in Perth.

Samantha Tait has moved on from the Department of Defence n Adelaide, and has taken up a position as a Project Manager with BMT Defence Services (Australia) in Melbourne. She has also recently been elected Chair of the Victorian Section of RINA (see *News from the Sections* elsewhere in this issue).

Peter Tomic, a graduand in naval architecture from the Australian Maritime College, has taken up a position with Strategic Marine in Fremantle.

Tom Urie, a graduand in naval architecture from the Australian Maritime College, has taken up a position with the Australian Submarine Corporation in Adelaide.

Jan Verdaasdonk has completed his research master's thesis at Royal Melbourne Institute of Technology's Wacket Centre for Aerospace Design and has taken up a position as a naval architect/marine engineer with Australian Maritime Technologies in Williamstown. Prior to his master's studies, Jan worked as a documentation assistant for the European Patent Office in The Hague, and as a lecturer's assistant in marine engineering at Delft University of Technology in The Netherlands.

Ryan Watts, a graduand in naval architecture from the Australian Maritime College, has taken up a position with SubSea7 in Stavanger, Norway.

Geoff Wilhelm has moved on from the In-service Design Group for the Royal Australian Navy, and has taken up the position of Deputy Director (Naval Architecture) in the Centre for Maritime Engineering of the Department of Defence in Sydney.

Tristan Williams, a graduand in naval architecture from the Australian Maritime College, has taken up a position with Sea Transport Solutions in Beenleigh, Qld.

SBLT Dominic Worthington has graduated from the RAN's Officer Training School at HMAS *Creswell*, Jervis Bay. He has been posted to HMAS *Sirius* at Fleet Base West, Fremantle, and is having a ball working up the Navy's newest acquisition and perfecting damage-control and fire drills.

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 Keith Adams when your mailing address changes to reduce the number of copies of *The Australian Naval Architect* emulating boomerangs (see *Missing in Action)*.

*Phil Helmore*
*Gregor Macfarlane*

# MISSING IN ACTION

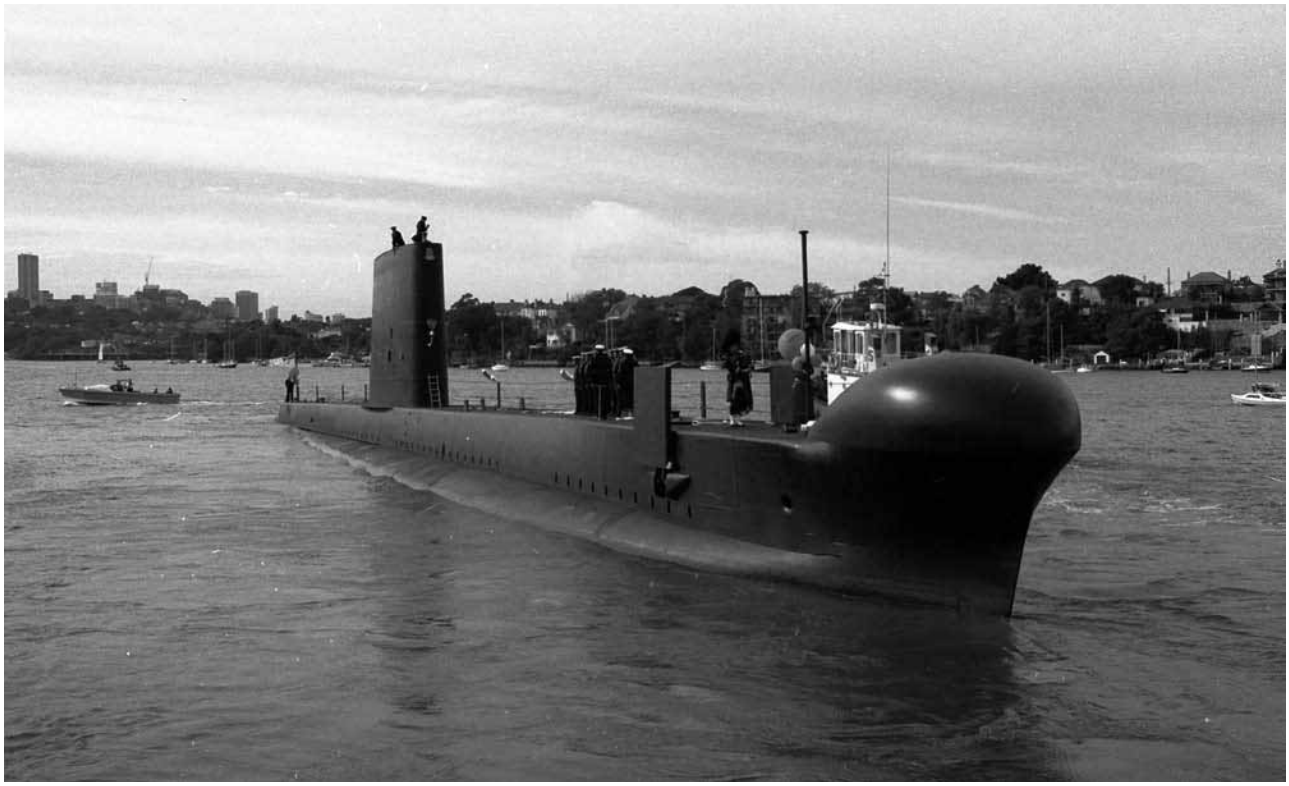
There is only one member missing in action. He is Mr D. P. McNally. His last known postal address was 7 Corfu Street, Falcon, WA 6210.

If anyone knows his present location, please let Keith Adams know on (02) 9878 4140, fax (02) 9878 5421 or email kadams@zeta.org.au.

# FROM THE ARCHIVES

## The Last Oberon Departs

After decades of service, the last of the RAN's Oberon Class submarines, *Orion*, has left Fleet base West for the Tenix facility on Cockburn Sound in Western Australia to be broken up. The Oberons were one of the most successful types of British diesel-electric submarine ever built. The first RAN boat, HMAS *Oxley* was commissioned into the RAN in 1967 and the last, HMAS *Otama* in 1978. HMAS *Orion*, the second last of the six, completed her last refit at Cockatoo Island in Sydney in 1991 and, after her last commission, continued to serve as a training platform for new generations of submariners for the RAN Collins-class submarines. Three of the RAN Oberons, *Onslow*, *Otama* and *Ovens*, remain as museum ships in New South Wales, Victoria and Western Australia. *Oxley* was broken up in Western Australia and *Otway* was scrapped in Sydney.



HMAS *Orion* leaving Cockatoo Dockyard in Sydney on 3 June 1991 after her last major refit
(Photo John Jeremy)


*Orion* ashore at Cockburn Sound for breaking up
(Photo courtesy Hugh Hyland)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