THE AUSTRALIAN NAVAL ARCHITECT

Volume 12 Number 2
May 2008

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Natchan World, Incat's latest 112 m wave-piercing catamaran built for Japanese owners, at speed during recent trials (Photo by Richard Bennett, courtesy Incat)

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From the Division President

The last few months have certainly provided much of interest for the naval architect. For me this can be summarised as books, television programs and the discovery one of the most famous of all Australian wrecks. Of these events, two in particular have caught my attention. The first was the publication of *The Collins Class Submarine Story – Steel, Spies and Spin*, a book by Peter Yule and Derek Woolner, and the second was the discovery of the wreck sites for HSK *Kormoran* and HMAS *Sydney* II.

The book written on the Collins-class submarine was a refreshing read. The book is full of stories which reflect on the excellent work of many to ensure that the Collins class is the most-successful conventional submarine currently operational worldwide. The authors in their research did not rely on the wealth of newspaper or television articles which constantly critised the project, but based their information on interviews with people who were involved and from official documents associated with the project. It was also written in such a manner that it does not contain acronyms or technical terms which can often confuse the non-technical reader. The book also contains views and opinions of many people who are all known to us in the industry. I, personally, think that the authors have reflected those personalities rather well (including John Jeremy). As naval architects we can learn a lot from this book, not only in terms of the subject matter which describes the largest and most complex engineering project ever undertaken in Australia, but also in how historians use clear language so that all can understand.

It is incredibly important that we document our activities so that others can learn from the lessons of the past and similar occurrences do not repeat themselves. Recently in one of the Royal Institution of Naval Architects journals there was an account of one RINA member who, along with his fellow passengers, survived the sinking of *Explorer II* late last year. This article, based on the author's personal experience, provided very-interesting reading and raised many questions that merit some further investigation.

The highlight of the recent months, in my opinion, is the discovery of the final resting places of HSK *Kormoran* and HMAS *Sydney* II. I do not think that there is anybody who receives this journal who has not been impressed by the quality of the photographs obtained from the wreck sites. The story of the confrontation between these two ships, together with the images of the site, was excellently reported in a recent ABC television documentary *The Hunt for HMAS* Sydney. If you listen to the sound track of this documentary, one sentence jumps out above them all. David Mearns says "It's up to the historians and naval architects to look at the wreckage and say what actually happened." So far I've only spent a few weeks reading about *Sydney* and the information is overwhelming. There are over twenty books written on the subject and probably just as many conspiracy theories. The most notable for me was the bag of goodies which was discovered washed up on a beach in the 1980s which supposedly contained letters and personal effects belonging to the Captain. The reason why, and what purpose these theories resolve, is a little beyond my understanding but now is the time to act on what David Mearns suggests. It is up to our profession to try and resolve what happened to *Sydney* and *Kormoran,* using the factual information from the site and to record this in plain concise English for the public to consume. This will then allow all those associated with the event to have a clear understanding of what probably happened. Hopefully this will be completed in a fashion similar to that in the book discussed at the top of my column and put all these theories to rest. The overall outcome will then be similar to that which has been agreed for the submarine HMAS *AE2*. As I have explained to many of my friends and associates over the past months — let the wreckage lie where it came to rest, but ensure that the story is told to the best of our ability.

Stuart Cannon

Editorial

Lost at sea. The words have a dreadful finality about them. The loss of any ship is a tragic event which few of us who make our business in ships and on the sea wish to contemplate. In war the risk of loss can be high and many fine ships and sailors lie beneath the oceans of the world having lost the battle to survive.

The loss of a fine ship and her crew, like HMAS *Sydney* in 1941, is even harder to bear when they disappear almost without trace and with no survivors to tell the story of the last desperate hours.

Sixty-six years is a long time to wait for answers to the many questions about the action between *Sydney* and *Kormoran* on the evening of 19 November 1941. It took new skills and technology and the determination of the Finding Sydney Foundation but we now know where *Sydney* lies — deep and well preserved — a time capsule ready to tell her story.

Over the coming months, the hundreds of photographs and the hours of video of the wreck will be studied in detail and the most likely sequence of events onboard *Sydney*, as she steamed slowly away from *Kormoran* towards the south-east horizon, will surely emerge. It is a forensic task which must be approached carefully and unemotionally. Hopefully, when the work is complete, we can then let HMAS *Sydney* and her ship's company rest in peace.

John Jeremy

A badge produced by Hoyts Theatres to commemorate HMAS *Sydney's* sinking of the Italian cruiser *Bartolomeo Colleoni* during the Battle of Cape Spada on 19 July 1940
(John Jeremy Collection)

Letters to the Editor

Dear Sir,

I have just finished reading my copy of the February issue of *The Australian Naval Architect*, which I always read from cover to cover and find it interesting and informative. However, the article by Stuart Friezer on *Consideration for Sydney Ferries' Future* I find a bit disturbing.

It appears that Mr Friezer has missed some very important aspects of the Freshwater-class ferries, in that they are double ended and their turn-around time is quick, simply in-and-out without fuss. There are usually two Manly ferries on the run, and it would take 12 of Mr Friezer's wave-piercers to carry the same number of passengers as two Freshwater-class vessels. Can you imagine 12 wave-piercers (not at once but at close intervals) trying to turn to reverse in or out of Circular Quay? Reversing and turning a wave-piercer in the limited space available would be time wasted — and awkward — with other ferries all trying to do the same thing.

Any new ferries for that run, in my opinion, should be double ended, whether they are catamarans or monohulls, and it is not impossible with the new azimuthing propulsion systems. For catamarans, the propulsion systems could be installed amidships port and starboard through the wing deck and, for monohulls, they could be installed fore-and-aft on the centreline. I would still like to see rudders fitted at both ends with the forward rudder locked centrally when going ahead.

Having worked on, and been involved in, recreational sailing on Sydney Harbour for around 50 years, I just could not imagine the havoc that would be caused by 30 kn ferries running every ten minutes across the harbour. It is bad enough with thrill-seeking vessels doing their unpredictable figure-of-eights in front of other vessels. As an example of what havoc high-speed ferries can cause in limited areas, just have a look at the record of incidents caused by the Rivercats, and they are only running at 25 kn!

Manly is only 11 km from the city and it would take 2 km at each end for the ferry to reach 30 kn, leaving only 7 km, or 8 minutes' running time, at speed — which is not good for machinery.

Having worked for Alan Payne during the design of the First-Fleet catamaran ferries, I know that Alan went to great lengths to develop the manoeuvrability of those vessels, with additional rudders and the way they were fitted. I have watched these vessels in action, and they are the quickest-turning vessels in the confines of Circular Quay.

Mr Friezer also mentions private operators but, from past experience, this has been a failure as I don't think it is possible to run public transport at a profit without charging the earth for fares. If there is no profit, then there is no maintenance, and that has been the problem in the past. The only reason a private company bought into the Manly ferries in the past was to strip the company of its valuable assets, and this is well documented in Tom Mead's book *Manly Ferries of Sydney Harbour.*

Bill Bollard
Retired Ship Surveyor

And Stuart Friezer replies:

Dear Sir,

I would like to thank Bill Bollard for his comments. I welcome them and hope that this debate will grow and lead to a positive outcome for our Sydney Harbour ferries.

Since writing my article, I have produced a detailed weekday timetable for my idea of seven 400-passenger fast wave-piercing catamaran (WPC) ferries. This timetable shows that we need six "Manly SeaCats" during the peak periods to carry up to 2400 passengers per hour (pax/h) each way, compared to the three Freshwater-class vessels carrying 1600 pax/h. The seventh fast WPC ferry is held in reserve to give the opportunity to achieve a 98% reliability of the service.

Circular Quay traffic congestion is an important issue and I also am concerned; however, Mr Bollard has very much over-stated the problem. Looking at the peak-hour timetable, two ferries should pass each other at the Opera House. In a worst-case scenario, we could have one ferry berthed, one berthing and one turning but, given that a catamaran can turn in its own length, this should be fine. The ferries are intended to make 30 kn at around 85% MCR, and will have a reserve of speed to call upon to meet the timetable and avoid congestion. In off-peak times we need two Manly SeaCats operating at 22 kn to make a ½-hour timetable, so congestion will not be a problem.

I agree that double-ended ferries are definitely an option, but they are not without their own drawbacks. The drive systems, to my knowledge, are not very suitable for higher speeds and there are significant increases in hull drag. The First Fleet-class catamarans with which Mr Bollard was involved are *not* double ended for these same reasons, even though they operate at lower speeds.

The concern of 30 kn ferries in the harbour is legitimate; however, in my reading of Tom Mead's *Manly Ferries of Sydney Harbour,* he points out that this was also the case when the hydrofoils were introduced and that *despite their speed, the hydrofoils do not figure in as many accidents as the ferries. Even at high speeds they are very manoeuvrable and can usually avert trouble more easily then the slower-moving but less-nimble ferries.* My experience racing sailboats on the harbour shows that the Freshwater-class ferries can do little more than slow down or speed up to negotiate traffic. On weekends, I envisage that the off-peak ½-hour timetable will be used for the Manly SeaCats. At 22 kn, being much smaller and more manoeuvrable, I am positive that sailors will be pleased with their manoeuvrability and the safety records will improve.

Ramp-up times and distances are surprisingly short for catamarans with a low displacement/length ratio, and the new Manly SeaCats will *not* take 2 km to ramp up to speed. The new ferries will ramp up faster than the current JetCats, which have a big resistance hump at their hull speed and low thrust from their jet units at lower speeds. From my observations, the JetCats still ramp up within 1 km of Manly Wharf, despite turning around and observing the speed-restricted zone.

Private operators are a concern, but being government-run has many concerns as well. The government-run ferry service is prone to political pressure, and has a history of

"Manly SEACAT" Weekday Ferry Timetable

From Manly

Depart Time	From	Ferry	Speed knots	Arrive C'Quay	Max Pax
06:00:00	Manly	Manly SeaCat 2	22	06:16:00	400
06:30:00	Manly	Manly SeaCat 1	22	06:46:00	400
07:00:00	Manly	Manly SeaCat 2	22	07:16:00	400
07:30:00	Manly	Manly SeaCat 1	30	07:42:00	400
07:40:00	Manly	Manly SeaCat 3	30	07:52:00	400
07:50:00	Manly	Manly SeaCat 5	30	08:02:00	400
08:00:00	Manly	Manly SeaCat 2	30	08:12:00	400
08:10:00	Manly	Manly SeaCat 4	30	08:22:00	400
08:20:00	Manly	Manly SeaCat 6	30	08:32:00	400
08:30:00	Manly	Manly SeaCat 1	30	08:42:00	400
08:40:00	Manly	Manly SeaCat 3	30	08:52:00	400
08:50:00	Manly	Manly SeaCat 5	30	09:02:00	400
09:00:00	Manly	Manly SeaCat 2	30	09:12:00	400
09:30:00	Manly	Manly SeaCat 1	22	09:46:00	400
10:00:00	Manly	Manly SeaCat 2	22	10:16:00	400
10:30:00	Manly	Manly SeaCat 1	22	10:46:00	400
11:00:00	Manly	Manly SeaCat 2	22	11:16:00	400
11:30:00	Manly	Manly SeaCat 1	22	11:46:00	400
12:00:00	Manly	Manly SeaCat 2	22	12:16:00	400
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14:00:00	Manly	Manly SeaCat 2	22	14:16:00	400
14:30:00	Manly	Manly SeaCat 1	22	14:46:00	400
15:00:00	Manly	Manly SeaCat 2	22	15:16:00	400
15:30:00	Manly	Manly SeaCat 1	22	15:46:00	400
16:00:00	Manly	Manly SeaCat 2	22	16:16:00	400
16:30:00	Manly	Manly SeaCat 1	22	16:46:00	400
17:00:00	Manly	Manly SeaCat 2	30	17:12:00	400
17:10:00	Manly	Manly SeaCat 4	30	17:22:00	400
17:20:00	Manly	Manly SeaCat 6	30	17:32:00	400
17:30:00	Manly	Manly SeaCat 1	30	17:42:00	400
17:40:00	Manly	Manly SeaCat 3	30	17:52:00	400
17:50:00	Manly	Manly SeaCat 5	30	18:02:00	400
18:00:00	Manly	Manly SeaCat 2	30	18:12:00	400
18:10:00	Manly	Manly SeaCat 4	30	18:22:00	400
18:20:00	Manly	Manly SeaCat 6	30	18:32:00	400
18:30:00	Manly	Manly SeaCat 1	30	18:42:00	400
19:00:00	Manly	Manly SeaCat 2	22	19:16:00	400
19:30:00	Manly	Manly SeaCat 1	22	19:46:00	400
20:00:00	Manly	Manly SeaCat 2	22	20:16:00	400
20:30:00	Manly	Manly SeaCat 1	22	20:46:00	400
21:00:00	Manly	Manly SeaCat 2	22	21:16:00	400
21:30:00	Manly	Manly SeaCat 1	22	21:46:00	400
22:00:00	Manly	Manly SeaCat 2	22	22:16:00	400
22:30:00	Manly	Manly SeaCat 1	22	22:46:00	400
23:00:00	Manly	Manly SeaCat 2	22	23:16:00	400
23:30:00	Manly	Manly SeaCat 1	22	23:46:00	400
00:00:00	Manly	Manly SeaCat 2	22	00:16:00	400

From Circular Quay

Depart Time	From	Ferry	Speed knots	Arrive Manly	Max Pax
06:00:00	C' Quay	Manly SeaCat 1	22	06:16:00	400
06:30:00	C' Quay	Manly SeaCat 2	22	06:46:00	400
07:00:00	C' Quay	Manly SeaCat 1	22	07:16:00	400
07:30:00	C' Quay	Manly SeaCat 2	30	07:42:00	400
07:40:00	C' Quay	Manly SeaCat 4	30	07:52:00	400
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21:00:00	C' Quay	Manly SeaCat 1	22	21:16:00	400
21:30:00	C' Quay	Manly SeaCat 2	22	21:46:00	400
22:00:00	C' Quay	Manly SeaCat 1	22	22:16:00	400
22:30:00	C' Quay	Manly SeaCat 2	22	22:46:00	400
23:00:00	C' Quay	Manly SeaCat 1	22	23:16:00	400
23:30:00	C' Quay	Manly SeaCat 2	22	23:46:00	400
00:00:00	C' Quay	Manly SeaCat 1	22	00:16:00	400

Notes:

- Manly SeaCat 7 is held in reserve.
- In a single 1 1/2 hour peak period the 6 x 400pax Manly Seacats can move up to 8000 passengers, 4000 each way.
- Peak Service require 2 wharves at Manly and Circular Quay.
- Off-Peak service requires 1 wharf at Manly and Circular Quay.
- Daytime Off-Peak service could be done with 3 vessels at 13 knots similar to existing Freshwater Class timetable if that is more appropriate.

Advantages of 400pax Ferry Service over 800pax:

- Lower capital cost.
- Faster passenger loading times / less queing.
- Much better and quicker manouvreing / better safety when the harbour is busy.
- Should be able to berth themselves with Captain, Engineer & Deck Hand on board.
- Much less wash / environmental damage from smaller lighter vessles making more runs.
- Smaller vessels are easier and cheaper to maintain.

Stuart Friezer's proposed Manly ferry timetable

making bad business decisions. The modern public-private partnership arrangements are becoming common these days, with waste services and public transport the most common. Most arrangements have proven to be very successful and, if our ferries are to also do this, we must tailor make the agreement to ensure that all the requirements of the public are met without asset stripping and/or other negative outcomes. A company which wants a long-term business relationship with the public/government is not representing its shareholders to do so. According to Tom Mead, the most successful years of the Manly Ferries were under the privately-owned Port Jackson & Manly Steamship Company.

I look forward to seeing much more discussion soon.

Stuart Friezer
Naval Architect

Dear Sir,

I am fortunate enough to live in a location where I can take a ferry on Sydney Harbour to university every day. From the somewhat-poor reputation of public transport I find that, by comparison, the Sydney ferries are much more reliable than other forms of public transport, yet they are not commonly used.

Mass utilisation of public transport is vital to the reduction of greenhouse gas emissions as well as reducing the congestion of roads. It is my opinion that public transport on Sydney Harbour is both underused and lacks infrastructure. In the morning and afternoon peak-hour periods, the ferries are full, often with standing passengers. However, during the day I estimate that most ferries would carry as little as 5–10% of total capacity.

I consider that a solution would be to introduce a fleet of smaller, faster ferries, with a passenger capacity of the order of that of a bus (as opposed to the ferries of around 400-600 passengers). Higher speed would allow more trips to be made per day, thus helping to offset the decreased passenger capacity. More regular and faster trips would make the ferry more convenient, and would encourage use of the ferry. To help with passenger demands at peak periods, more ferries could be used in high-demand times.

Of course, this is not a solution for every route, and larger capacity would still be needed in peak times, as well as special considerations for less-protected routes. I believe that further investigation into this matter would yield useful and interesting results.

Hamish Bush
UNSW Student

Dear Sir,

The issue of climate change worldwide has become increasingly high-profile in the past two years. It has been informative to follow related developments in the marine industries through *The Naval Architect* and *The Australian Naval Architect*. The article which appeared in the June 2007 issue of *The Naval Architect* on future emissions reduction in the shipping industry was particularly interesting. It raised questions about the impact of future multilateral emissions legislation, the proposed MARPOL tier-system limits, and the financial effects of carbon trading schemes (Nicholls 2007).

I think that it is going to become financially necessary to reduce the greenhouse emissions of ships designed and produced by the marine industry to levels far below those limits prescribed by the current MARPOL regulations. This process needs to take place as soon as possible so that ships already in the design and production stages can benefit throughout their service lives.

Governments worldwide have begun the process of setting emissions targets and introducing carbon-trading schemes. The parliament of the United Kingdom has recently published the Draft Climate Change Report which includes a section investigating methods of reducing marine transport emissions. According to the European Environment Agency, the absolute levels of marine emissions are expected to grow by 35–40% between 2001 and 2020 (EEA 2006). The flow-on effect of emissions-reduction legislation is likely to increase vessel operating costs, as carbon trading puts a high price on SOx, NOx and CO_2 emissions.

I look forward to coverage of the impacts of regulation on the industry, and hope that significant action is taken across the board. Anticipating the financial costs of future emissions is a necessary first step to a cleaner, forward-thinking industry which can adapt to the future.

Rebecca Dunn
UNSW Student

References

Nicholls, C. (2007), Future Uncertainty over Emissions Reduction, *The Naval Architect,* RINA, London, June, pp. 10–11.

European Environment Agency (2006), Transport and Environment: Facing a Dilemma, *EEA Report No.3/2006*, p. 16.

Dear Sir,

As a budding young naval architect, currently in my fourth year of study at the University of New South Wales, it is amazing to see the variety of work being done in the industry. When I started my degree I had little or no idea of what I was getting myself into; all I knew was that I wanted to work with boats, and the program offered at UNSW seemed to give me the best opportunities to do so. However, it took until earlier this year to start realising how much varied work there is out there. From reading publications such as your own and those put out by RINA, as well as industry visits undertaken as part of the UNSW naval architecture degree programme, quickly I am learning of the vast horizon of options for naval architecture graduates.

My point in writing, however, is to express my surprise at the lack of awareness of others of what naval architects actually do. When speaking to other, non-naval architecture students, or even just generally to people I meet, most of them stare blankly when told what it is I study. What's more alarming is the lack of students currently studying naval architecture when compared to those doing say, aerospace engineering or mechanical engineering, when it is such a vital industry and constantly making exciting new technological developments.

On the other hand, there is something quite thrilling about being involved in an industry which plays such a vital role in keeping the world running the way it does, yet is so elusive to the majority of the population; an industry with a level of rich history rarely comparable to any other. With so few people studying naval architecture, we are a tight-knit community. For example, out of around 40 000 students at UNSW, only around 50 of those study naval architecture, or an average of only 12 in each year of study.

I suppose the question to think about is: do we want more people made aware of our industry and what we do, or are the perks of obscurity well worth it?

Bryan Kent
UNSW Student

NEWS FROM THE SECTIONS

Western Australia

Annual General Meeting

The Western Australian Section held its AGM on the evening of Wednesday 16 April. Deputy Chair, Roger Best, presented a summary of the Section's activities over the last year. These included included a number of technical talks arranged in conjunction with the WA Branch of IMarEST. Topics ranged from the present (*Challenges Encountered Building a Landing Platform Dock*) to the ancient (*Building Hatsheptuts Punt Ship*). It was acknowledged at the AGM that technical presentations were generally well attended by RINA and IMarEst members alike.

Treasurer, Jim Black, presented a brief summary of the financial status of the section, which included a healthy positive bank balance.

At the meeting, two changes to the committee were decided. Kalevi Savolainen resigned from the committee due to work commitments which leave him unable to contribute to the running of the section. A new committee member, Kristofer Rettke, was elected.

As a result, the committee for 2008 is as follows:

Chair	Colin Spence
Deputy Chair	Roger Best
Treasurer	Jim Black
Secretary	Max van Someren
AD Council Nominee	Roger Best
Members	Tiju Augustine
	Kristofer Rettke

Technical Meetings

The WA Section hopes to enter the following year with a continued programme of interesting and informative presentation for its members. If any member would like to make a presentation, or knows a colleague who would be keen to do so, the please feel free to contact me at max.vansomeren@austal.com.

Western Australian Section Library Updated

The Western Australian Section maintains a technical library, recently updated with several new donations. The library has been relocated to the Curtin University facility at Fremantle Yacht Club, where it is available for all members. The library provides a wealth of technical information. This includes RINA and SNAME transactions, journals, periodicals and a wide variety of books. The library catalogue may be viewed on the WA Section page of the RINA website. To look at or borrow an item please contact me at max.vansomeren@austal.com. The Section is also keen to hear from any members who may have items which they would like to donate to the library.

Max van Someren
Secretary

Victoria

Annual General Meeting

The Victorian Section held its AGM on the evening of Thursday 10 April in the SKM Theatrette, Armidale. Ken Hope has retired from the position of Treasurer, and thanks are extended to him for his many years of service. The following were elected/re-elected:

Chair	Samantha Tait
Honorary Secretary	Edward Dawson
Treasurer	Tristan Andrewartha
AD Council Nominee	Samantha Tait
Members	Stuart Cannon
	Goran Dubljevic
	Craig Gardner
	Sean Johnston
	Lance Marshall
	Brett Morris
	Alan Taylor (joint IMarEST member)

The Collins-class Submarine Story

Dr Peter Yule, the author of the new book *The Collins Class Submarine Story: Steel, Spies and Spin*, made a presentation about the book to a joint meeting with the IMarEST attended by more than 40 on 10 April in the SKM Theatrette, Armidale. Peter spoke about the recent release of the book in Sydney (see separate article in the *From the Crow's Nest* column) and provided the audience with some entertaining insights into the book's revelations. An excellent turn out of members and guests saw the Victorian Section grow in strength and commitment to providing its members with interesting and topical meetings.

Award for Local Member

Congratulations to local member, Tristan Andrewartha, who recently won the prestigious RINA Wakeham Prize for his joint paper *Replenishment at Sea: Motions of Ships Operating Side by Side in Head Seas*, published in *International Journal of Maritime Engineering* 149(3), 2007. The Wakeham Prize is awarded annually for the best general paper published by the Institution by a member under the age of 30. Tristan managed to keep that one very quiet for a while but, now that it is more widely known, he has agreed to make a presentation to us later in the year.

Samantha Tait
Chair

New South Wales

Committee Meetings

The NSW Section Committee met on 25 February and, other than routine matters, discussed:

- SMIX Bash: Most accounts have been paid, and figures show a small surplus after all expenses, to be shared equally with IMarEST; the silent auction of the model of *Lady Hopetoun* raised $700, and the raffle raised $248, both of these proceeds being donated to the Sydney Heritage Fleet; certificates of appreciation and letters of thanks to sponsors will be completed within the week; SMIX Bash 2008 will be held on Thursday 4 December.
- TM Program for 2008: Program is almost complete, with one presentation to be confirmed.
- Pacific 2008: Crewing of RINA stand undertaken by Chief Executive, Trevor Blakeley, members visiting from interstate, and members of the NSW Section

Committee; Trevor Blakeley had emailed helpers and published a Letter to the Editor in the February issue of *The ANA*, thanking them for their efforts.

- Committee Membership: Recruitment of members to the committee discussed.
- AGM: The notice of the AGM was printed in the February issue of *The ANA*, contrary to the previous practice of mailing a notice as an inclusion with *The ANA*; this may be a good example for other sections to follow, as it saves on mailing costs.

The NSW Section Committee also met on 7 April and, other than routine matters, discussed:

- SMIX Bash: *James* Craig has been booked for Thursday 4 December 2008 and the deposit paid; SHF have new caterers; mailing of certificates and letters of appreciation has been completed.
- TM Program: Presentations for regular meetings in 2008 all confirmed; one further meeting being investigated.
- Committee Membership: Prospective members to be invited to join committee.
- Report on AD Council Meeting: Report received (see separate report in the *Membership* column).

The next meeting of the NSW Section Committee is scheduled for 26 May.

Annual General Meeting

The NSW Section held its tenth AGM on the evening of 5 March, following the March technical presentation in the Harricks Auditorium at Engineers Australia, Chatswood, attended by eight with Graham Taylor in the chair.

Graham, in his first Chair's Report, touched on some of the highlights of 2007, which included ten joint technical meetings with the IMarEST (Sydney Branch), with attendances varying between fifteen for Colin Rudd's presentation on *Port Botany Expansion*, and forty-six for Rob Tulk and Steve Quigley's presentation on *The Design and Construction of Cutting-edge Vessels*. The EA move from North Sydney to Chatswood appears to be having a continuing effect on attendances, and the meeting times having been put back by half an hour does not appear to have improved attendances but has, at least, made parking legal! SMIX Bash 2007 was successful and was attended by 200, including a number of national and international guests. RINA had a stand at the Pacific 2008 International Maritime Exhibition, and the stand was crewed throughout by the Chief Executive, Trevor Blakeley, members visiting from interstate, and members of the NSW Section Committee.

Adrian Broadbent presented the Treasurer's Report. The EA venue at Chatswood had, as usual, been our major cost for the year. However, with a close watch on the outgoings, we had managed to operate within our budget and have a grand total of $166 in the Section account at 29 February 2008. SMIX Bash is funded separately through the Social account which currently has a healthy balance, although there are accounts still to be paid, but projections are for a sufficient surplus to enable preliminary arrangements for SMIX Bash 2008.

There is a number of changes to the NSW Committee for 2007. John Butler and Bruce McRae resigned from the Committee during 2007 due to the pressure of other things. Stuart Friezer has accepted a position on the committee, and has accepted the job of auditing the Section accounts. As a result, the committee for 2008 is as follows:

Chair	Graham Taylor
Deputy Chair	Craig Hughes
Treasurer	Adrian Broadbent
Secretary	Lina Diaz
AD Council Nominee	Craig Boulton
Auditor	Stuart Friezer
TM Program Coordinator	Phil Helmore

Human Elements in Ship Design

Dr Jonathan Earthy, Human Factors Coordinator for Lloyd's Register in London, gave a presentation on *People and Marine Systems — The Human Focus* to a joint meeting with the IMarEST attended by twenty-eight on 27 February in the Harricks Auditorium at Engineers Australia, Chatswood.

Introduction

Jonathan began his presentation by saying that IMO now refers to the "human element" to cover a multitude of human-related factors, such as competence, recruiting, management, and the like. He would therefore look at what the problem is, competent people and usable systems, design and operation of ships, and the human element in the rules and regulations.

Marine Human-element Issues Becoming Critical

There is a number of human-element issues which are becoming critical, for a variety of reasons:

- past experience and coping with new technologies;
- reduced crewing and dealing with critical situations;
- integration of the ship link into a whole transport chain;
- public pressure and the marine environment (the public always expects better and better performance);
- cultures, languages, attitudes, lifestyles, training and education (this is an international industry, and there are national differences in all of these, as well as attitudes between young and old);
- developing integrated operator-focussed systems
- testing of ship systems (systems are becoming so complex that it is impossible to test everything, so it is becoming a matter of deciding which tests are necessary and sufficient);
- competence and changes in regulations and technology (regulations are changing, not for the benefit of the crew, but to address other needs);
- regulation and modern operational needs;
- consequences of a single failure on large ships.

It is not obvious that new regulations promulgated by IMO are focussed on what the operator needs. The biggest gap is between what the operator actually needs, and in how the regulations are rolled out. New ships are larger than ever before, with more power, and here we are, reducing crewing requirements, so the consequences of *any* failure increase. All these factors raise the stakes for both people and systems.

Marine insurance claims have remained remarkably constant for the last twenty years or more, but have just doubled in the last year. The experience factor is decreasing, as officers

and crews are staying at sea for shorter periods, and few masters have experienced a one-in-twenty-year storm or would therefore know what to do in the face of one.

IMO Vision of the Human Element

IMO's vision for the human element is "to significantly enhance maritime safety and the quality of the marine environment by addressing human-element issues to improve performance".

Put simply, this means that people are the organisation's "safety barrier", and the focus should be on supporting human success. Everyone has a role to play, and we should identify and resolve all human–system issues, by looking at the whole system, including the people. There should also be a stronger link between operation and design.

Where are we Now?

Jonathan then presented a slide showing a matrix of Why? What? Where? How? and Tools? against Actions and Who-should-do those actions The tools presently available are not marine centred, because they have come from the offshore and information-technology industries. They are not cheap, either, but they will become cheaper as the tools develop a marine focus.

HE @ LR

Lloyd's Register has 15 staff involved in human-element issues worldwide, mainly in the marine and rail sectors. Jonathan is the overall coordinator; in Australia LR have Megan Brown and Stuart Dickinson, and in Hong Kong they have Karen Priestly, and a presence in New Zealand and North America. There are three consultants.

The issue of competence is not new. Until 1921, the name of the master and his years on board the vessel were included with the ship in Lloyd's Register book, as an indication of competence.

Marine HE Services

Jonathan then showed a slide of four ellipses having some overlaps in areas of responsibility:

- The ILO (International Labour Organisation) and IMO have responsibility for welfare and operational safety.
- Human-element services are responsible for making safety, by way of retention, resilience, efficiency and effectiveness.
- Corporate social responsibility (i.e. behaving decently) is having an increasing influence in large companies, especially those having shareholders.
- Classification societies are responsible for design attributes and technical quality.

Corporate social responsibility is about how companies manage their business activities, taking account of economic, social and environmental impacts.

The ILO MLC 2006

The new ILO Marine Labour Convention 2006 addresses the health, safety and welfare of seafarers. It is expected that this convention will be ratified in 2010 and implemented by 2014.

Awareness Raising

One of the ways in which awareness is being raised is by the publication of the journal *Alert!* which is published three times per year by Lloyd's Register (*and circulated with* The Naval Architect *to RINA members* — Ed.] This journal discusses the major human-element issues facing the marine industry such as fatigue; effective communications; automation and management of alarms; complacency and routinisation; slips, trips and falls; and seafarer health, safety and well-being.

People and Systems

The outcomes of getting it right include the safe and effective conduct of the ship; and the safe and effective completion of the mission or delivery of the cargo. This needs competent people and usable systems for them to operate.

Competent People

Factors affecting the delivery of competent people include:

- Manpower: the number of staff required to operate, maintain, sustain and provide training for the systems on board.
- Personnel: the physical and cognitive capabilities to train for the operation, maintenance and sustaining of the systems.
- Training: the requirement to provide personnel with their essential job skills, knowledge, values and attitudes.

Usable Systems — Human Factors

Human-factors engineering means the integration of all human characteristics into the development to optimise the human/system performance under operational conditions. A health-hazard assessment should look at short- and long-term hazards to health as a result of normal operation of the system. The safety risks occurring from the system being operated in both normal and abnormal modes should be minimised. Survivability should also be addressed as a matter of course; e.g. the escape of personnel, regardless of their skills or location.

All of these issues have strong regulatory support.

Typical Industry Problems

Typical problems faced by the marine industry include:

- Crewing attitudes and retention: the solution to long-term lack of crew may not be simply to pay more. If sailors go to sea to make money, and they earn it in shorter time, then they may just leave sooner!
- The environmental impact of human error has been increasing over time; witness some of the tanker groundings, culminating with *Exxon Valdez*.
- Vigilance/fatigue: the Australian regulator has some of the best material in this area and a good record.
- Trust in the equipment and systems: the crew may not trust the equipment because they don't understand it, and there are increasing instances where the crew have disabled equipment because they have thought that it was not working.
- Slips and falls are a massive insurance problem, and there is much to be done in this area.
- Training: one week of training may not be sufficient. Training comes off the operating budget, but perhaps it should not, as it is a through-life cost.
- Container lashing is becoming an increasing problem; it has been found on some new ships that the deck-stowed

containers could not be properly lashed, and the people who lash them have now to be industrial athletes!

There is no "silver bullet" or magic fix for these problems. Solutions must consider people as part of the system, and ensure delivery and maintenance of a system of work (and not just a ship, the equipment and crew). The design should take into account the expected skills, procedures and workloads, and consider the context of the use of each system, and be able to adapt to changes. The process should involve the users and monitor the systems in use. Don't just "feel the force", use the science (i.e. human sciences and ergonomics).

High-reliability Organisations

Characteristics of organisations in which there is a high degree of reliability include a preoccupation with failure (i.e. understanding what went wrong, and a commitment to fixing it), a reluctance to simplify interpretations, sensitivity to operations, commitment to resilience, and deference to expertise.

A human-centred approach provides a structure for the consideration of human-element issues, supports the development of a safety culture, and helps the crew. Human-centred principles look for continued improvement, learning from experiments, trials and prototypes. If this is tried early, then the input from the crew can be effective and continuous. Matching ships and systems to the people and tasks results in teamwork and cooperation between the stakeholders.

Usability

Usability is the extent to which a product (ship, system, equipment or procedure) can be used

- by a specified crew;
- to achieve specified goals; and
- with efficiency, safety and user satisfaction.

The context of the use involves the particular users, the particular tasks, and the particular equipment (e.g. hardware, software, or materials).

Linking Design and Operation

Jonathan then gave two examples of how the human element can be taken into account.

1. SOLAS Chapter V

Read as intended, SOLAS Chapter V/15 enunciates the principles relating to bridge design, the arrangement of the navigation systems and equipment, and bridge procedures. It says that the layout, design, procedures and interpretations of other relevant chapters should aim to:

- assist the work of navigation;
- support bridge resource management;
- aid ease of use; etc.

The operational requirements fit in with ISM and BRM requirements. However, the seven aims are difficult or impossible to assess directly. Systems will continue to evolve, and the approach needs to be able to cope. All human-element considerations need to be seen in context and appraised in a balanced manner with objective evidence.

The steps in developing the operability case would include defining the scope of the decision, the context, by the baseline of operability and risk (i.e. assessing what hazards

might arise). Ergonomic criteria would then be applied to the resulting change, and checking that the selected change actually works. Residual issues would then be tracked, and risks in the safety management system identified. It should be borne in mind that the extremes of risk are the same for any changes.

Benefits include safer operation, management of equipment costs, management of training costs, more satisfied crew, and an opportunity for manufacturers.

2. Crew Feedback MTO Cadets

There are increasingly-complex systems on board ships, and so there is a need to identify the risks. In addition, there has been a lack of feedback.

A project was undertaken to motivate and teach MTO Cadets and to obtain their feedback. The cadets were instructed in awareness of usability and in making good arguments in constructive criticism. They were trained in ergonomics, and were required to keep a log book, and LR provided assistance on the project. The results showed that some cadets had started to think in new ways about the equipment they were operating. Several collected design recommendations, and there were many comments in log-books, often with photos to illustrate the problem.

From the data collected, it became apparent that all ships have dimming problems; i.e. there was always some equipment on the bridge which could not be effectively dimmed so as not to interfere with night vision. Almost all had home-made instructions and warning signs! As an example, one hand-printed sign said "Start cooling-water pump before bow thruster" — if this was so important, then it should have been provided with an interlock, preventing starting of the bow thruster before the cooling-water pump.

Alarms are a huge problem. There is a recorded instance of a ship almost going aground because everyone on the bridge was absorbed in looking for an alarm which was going off, and it turned out to be the fax out of paper!

HE Best Practice for Ship Oerators

Best practice starts from the IMO vision statement, "Addressing human-element issues to improve performance". It describes the areas of management practice, looking at the "what is to be done" in addressing the human-element issues. It looks at what *is* done (the how is variable), shows how the human elements integrate into the management of the company, and enables the ship operator to see the whole picture and decide what to tackle first.

This scheme identifies human-element issues which, if not addressed, can become risks.

There are basically three areas of best practice in addressing the human elements: policy (setting the scene), management (walking the talk), and operations (doing the work).

There are various levels of human-element capability, and a scale has been developed to rate a company's performance:

1. HE not addressed
2. Reactive
3. Proactive
4. Managed
5. HE Optimised

There are plenty of resources now available for assessment of human-element issues, and often these are free, but they do have to be learned to use effectively.

HE Influences in Rules

There are many; not just in the rules of classification societies, but also in IMO, ILO, etc. And they will, in all probability, become more pervasive and important.

Recommendations

- Identify the human-element requirements in statutory documents.
- Investigate new or changed operational risks resulting from new or changed means of construction and outfitting.
- Train and equip surveyors with sufficient knowledge regarding the human elements.
- Use a more user-centred approach.

Conclusions

There is now no alternative to addressing the human elements in the design of ships, and we can do it. We need to realise how large and how hard the problem is, and we need to address the causes, not the symptoms. We need to treat the humans as what makes the ship safe, rather than as the cause of problems!

Jonathan concluded his presentation with a photo of *Queen Elizabeth 2* berthing at the Overseas Passenger Terminal at Circular Quay with the Opera House in the background, taken while he was enjoying a Bridge Climb the previous day.

Questions

Question time was, unfortunately, curtailed by our time limit at EA; however, some further interesting points were elicited.

Formal Safety Assessment was not mentioned specifically by Jonathan in his presentation, although it has been used extensively in the offshore oil and gas field. He sees it as a tool and a method by which the human element can be considered and brought into a risk assessment, giving these factors equal weight with mechanical factors. This should be a dynamic, through-life assessment.

The view of the human-element approach is that the person is the "safety barrier", but the view of technical standards leans more towards forgiveness of the human element. Jonathan's view is that large parts of risk assessment guard against human error. However, the next step is to look at the root cause of the error, and ask "why did this happen", and to decide what can be done organisationally to prevent re-occurrence. If a designer fixes one problem, this often introduces more rigidity and less flexibility. It is better to focus on how to do something better, rather than how to avoid doing it at all.

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

Sydney Slipways

Jonathan Toomey, CEO of Sydney City Marine, gave a presentation on *Sydney Slipways — The New Sydney City Marine Refit and Maintenance Complex* to a joint meeting with the IMarEST attended by 27 on 5 March in the Harricks

Auditorium at Engineers Australia, Chatswood. Jonathan is a qualified naval architect, engineer and ex-superyacht captain, having been employed in senior management positions with other successful shipyards, and brings to this development a raft of expertise to ensure that the vision for the project is achieved.

Introduction

Jonathan began his presentation with a photograph showing the location of the site of the new Sydney City Marine Refit and Maintenance Complex in Rozelle Bay, adjacent to the Anzac Bridge.

The Royle Report, completed in 1999, identified the need for a major repair and maintenance facility on Sydney Harbour. A proposal was approved in 2002 by the NSW Director-General of Planning, with the site being re-zoned for 24/7 operation, subject to requirements.

Sydney Slipways is the holding company for Sydney City Marine (SCM), and SCM tendered in the midst of intense competition for the project, and won. The initial lease on the site was for 32 years, but this has subsequently been extended to 38 years. The Development Application for the site has been approved, and construction is well under way. Nearly 10% of their costs have gone on the DA. Photographs of construction progress may be viewed on the SCM website at www.sydneycitymarine.com.au and clicking on Building Progress.

Development

The original proposal by SCM in 2003 was for a small-scale boat-repair facility for vessels up to about 200 t for an investment of $12 million. The development has subsequently expanded to cater for vessels up to about 800 t for an investment of $40 million. There are currently 36 slipways in Sydney harbour, of varying capacities and, of those, only six meet current environmental requirements. It is anticipated that, when Sydney City Marine opens in September this year, that some of the small yards, which do not meet the current environmental requirements, may close.

The approved proposal is now for 600 m of in-water berthing and repair, an 800 t shiplift, a 140 t slipway, and a 100 t straddle carrier. There will be specialist paint booths 80 m long × 40 m wide × 22 m high which will accommodate most vessels on the harbour, including visiting super-yachts. It will also be possible to maintain larger vessels under these covers, with shrouds over protruding items.

SCM will employ a core team of people to cater for all vessel movements, wash-down, etc. There will be on-site contractors to take care of special repairs, such as boilermakers, welders, stainless steel fitters, engine manufacturers, and the like. They want this to be a one-stop shop, without large overheads. There will be an office building with a car park underneath, and retail stores, ship chandlers, engine manufacturers, etc.

The Market

The average size of vessels currently using slipway facilities in Sydney Harbour is just under 20 m. However, since 2000 the market has been growing at 3% per year, while the size of vessels has been growing at 5% per year. In 2000, eight super-yachts visited Sydney while, in 2006, more than 100 visited, contributing well over $100 million to the local economy. At present the larger vessels in Sydney Harbour, e.g. the tugs and Manly ferries, have to use the Captain Cook Dock at Thales Australia, Garden Island, or go elsewhere, including Newcastle, Brisbane and Auckland, New Zealand.

The SCM berths at Rozelle Bay will have a depth of water of 8 m at low water, which will easily cater for all vessels expected, including the tugs, super-yachts and maxi-yachts. Maxi-yachts are only limited by the air draft under the Sydney Harbour Bridge, which is 49 m.

Plenty of off-street parking is provided; lack of it is a real problem at some slipways around Sydney. This is the only facility on the harbour with few constraints.

Water Harvesting

Water is a valuable resource and SCM have developed a novel solution: rain water from the roofs of the buildings will be collected and sent to storage tanks with a capacity of 5 ML. This water will be used for shipyard activities, such as high-pressure vessel cleaning. The water that runs off from this type of activity then passes through a series of filters to remove most of the solid particles, from whence it is sent to an on-site treatment plant which purifies the water to Class A industrial standard. The water is then returned to the storage tanks for reuse.

Based on last years rainfall figures, the site will be completely self sustaining for water usage, apart from domestic use such as drinking water and showers. In essence, there will be no drainage of water into the harbour, or any need to draw off Sydney's water supply.

Dust Mitigation

To ensure that dust settling on the site from activities such as sanding down a hull do not get blown into the harbour, the site will be vacuumed daily by a ride-on vacuum cleaner. If it is windy while dust-generating activities are taking place, the boat will be either put under cover or temporarily shrouded.

Water Purification

During Jonathan's presentation, Judd Webber of Elecropure gave a demonstration of cleaning dirty water by electro-flocculation. The principle is to pass an electric current between metal plates in water. The metal of the anode goes into solution, attracts the pollutant particles by flocculation, and is subsequently deposited on the cathode. However, the pollutant particles are insoluble in water once treated, and hydrogen gas floats them to the top, where they can be easily removed. Iron and aluminium are well-known flocculants.

Judd poured a jarful of potter's clay into a glass tank and stirred it around, then turned on the current. Seven minutes later, the audience could see that the water was clear, with the pollutant floating on the top. This process removes not only pollutant particles, but bacteria like *escherischia coli* as well.

Noise Mitigation

The site has been zoned for operation 24 hours per day, 7 days per week, but with stringent noise restrictions. As a result, the buildings are clad with acoustic damping material. The perimeter of the site, where noise can travel to local residences, is surrounded by an acoustic damping fence which is 2.5 m high.

The ability to operate 24/7 is a commercial advantage, as it reduces time out-of-service. A Sydney ferry, for example, can lose $100 000 per day out of service. If that time can be reduced, it is a win-win situation.

SCM is very conscious of the community, and will have regular community consultation.

Mitigation of VOCs

Volatile organic compounds (VOCs) are emitted from paints (including water-based house paints), varnishes, glues, styrenes, etc.; basically any product containing a solvent. Legislation currently only applies to users emitting more than 5 t per year. However, this provides a dilemma for high-quality paint suppliers. Usual methods of mitigation are to use a greater percentage of solvents in the paint, or to use paints with little or no VOCs.

SCM will be the only maintenance facility in Sydney with mitigation on site meeting the current environmental requirements.

Removing Vessels from the Water

SCM will have five methods of removing vessels from the water for inspection and maintenance of the underwater hull:

- an 800 t shiplift;
- a 600 t self-powered hydraulic vessel transporter;
- a 140 t slipway;
- a 100 t straddle carrier; and
- a 47 t submersible boat trailer.

The shiplift has a platform 44 m long × 14 m wide, catering for a maximum draft of 8.5 m, with a maximum distributed load of 30 t/m, or maximum payload of 800 t. It has been designed and built in Australia to AS 1418.1, and certified by Lloyd's Register for lifting appliances in the marine environment. It is expected to cater for 95% of the local target market. There will be divers provided to ensure that there are no docking problems provided by appendages or post-construction hullform modifications.

Jonathan quoted a recent example from his own experience, where a shipyard in trying to save the $500 cost of a diver to inspect the vessel in the cradle, caused major damage to an aft engine-room bulkhead entailing $25 000 for repairs!

The 600 t vessel transporter is expected to be able to handle most of the tugs, and will be able to place the vessel anywhere on site, or in one of the sheds. It is actually a modular system, and can be used in 200 t, 400 t or 600 t configurations. It is self powered, and radio controlled, enabling one person (theoretically, at least) to be able to move a 600 t vessel at will.

The 100 t straddle carrier has a big footprint which is required for manoeuvring and lowering vessels onto the small transporter for movement around the yard. Its primary use will be for removing vessels from the water for placement in a dry storage adjacent to the yard which will cater for up to 100 vessels of up to 15 m in length.

The 47 t boat trailer is pulled by a tractor, with hydraulic controls and has an adjustable width. It can remove vessels from the straddle lift, or be used in conjunction with the lifters. It can be used on the slipway for yachts, keeping the yacht level and avoiding point loads on the vessel as it comes over the brow of the slipway.

Specifications and Quoting

SCM are developing their own information technology and quality management systems. This will allow them to quote, do their own accounting, perform KPI (key performance indicator) analysis, and provide OH&S documentation. They expect to be putting through about 30 boats per day, and this could present a logistical nightmare without an appropriate system to manage it.

There will be a vessel database, on which an owner will be able to view the details of his/her own vessel (and only their own vessel), including past history of work, via the web. New customers will also be able to go in online and enter details of their vessel.

Requests for work on a vessel can be made online, and an estimate of cost for the work will be returned electronically. If the owner is interested, he/she can reply by phone or email, and request a date for commencement.

Another interesting facet is the estimating and parametric cost-modelling technique, which will allow rapid estimation of repair costs. For example, the cost for painting would include the type of paint and rate of application per unit area, the cost of the paint per unit area, the cost of labour to apply per unit area, and the hire of equipment required, giving a total cost. This will be developed as they gain experience.

Conclusion

In conclusion, Jonathan said that, when SCM commence operation in September this year, they expect to be the cleanest, greenest operation around. They have the best technology, and that is one of the keys to customer service. They hope to improve the standards of boat servicing on Sydney Harbour.

Questions

Question time was, unfortunately, curtailed by our time limit at EA; however, some further interesting points were elicited.

SCM will have the capability to blast vessels, as this is an essential service. The paint sheds have been designed with state-of-the-art equipment for painting, especially for superyacht paintwork. The sheds are flush lined internally so that there is no build-up of abrasive from blasting materials, but they also use curtains as well. After blasting, the curtains are drawn and washed, and the inside of the shed is cleaned with a ride-on vacuum cleaner.

The transporter can also handle catamarans; they would use a U-shaped cradle with outriggers.

The old Glebe Island Bridge is not expected to provide much limitation on operations; most large vessels will be handled by the slipway, for which they do not have to pass the old GI Bridge, and there is no problem for the straddle carrier.

There will be resident contractors on site. If an owner wishes to use an outside contractor, then he/she can do so; however, SCM will require invoices to go through their books, and they will add a 20% fee, unless the service is one not provided at the yard or there is an OEM requirement. This is expected to discourage the practice, because there are issues at stake. For one, there is the problem of insurance; on-site trades people will be aware of the required OH&S and environmental requirements, and they cannot have out-

side contractors coming into the yard and doing things their own way. For another, the on-site trades are paying for their leases to be there, and so the management has an obligation to direct work to them.

The vote of thanks was proposed, and the "thank you" bottle of wine presented, by Chris da Roza, who said that many people were looking forward to seeing the commencement of operations.

In reply, Jonathan said that it he would welcome RINA and IMarEST to visit the site and see the operations of the yard when they commenced. Watch the *Coming Events* column!

New Tugs for Weipa

Neil Edwards, Principal Consultant and Surveyor of Edwards Marine, gave a presentation on *Design and Construction of Two 55 t Bollard Pull ASD Fire-fighting Escort Tugs for the Port of Weipa* to a joint meeting with the IMarEST attended by 29 on 2 April in the Harricks Auditorium at Engineers Australia, Chatswood.

Introduction

Neil began his presentation by giving some background to the need for new tugs in the Port of Weipa. Towage requirements have previously been met by an aging fleet of twin-screw tugs, including a Barnes-and-Fleck-designed 29 m vessel with 41 t bollard pull built in 1976, and *Comalco Beagle* which has now been sold to Korevaars and is operating in Melbourne (and Neil welcomed both Tom Korevaar from Sydney, and John Korevaar who had flown from Melbourne for the presentation). Recent surveys showed that the tugs were sound and reliable, but of limited capability.

The Need for More Tugs and Bollard Pull

The Port of Weipa is expanding. In 1997 the throughput was 12 Mt/a of bauxite and, by 2007, this had grown to 12 Mt/a. A second ship-loader has now been commissioned, and it is clear that the port will need simultaneous tidal movements, i.e. one vessel arriving and one vessel departing on the same tide. There is simply not enough tugs, and not enough bollard pull to meet the need.

There is a draft limitation on vessels using the port, not in the port itself but on the passage from Weipa to Gladstone, limiting the size of vessels to about post-Panamax, or 80 000 t. A simulation exercise conducted at the Australian Maritime College has shown that they need to upgrade the bollard pull of tugs in the port to at least 50 t.

Procurement

Following discussions with Rio Tinto and the Weipa pilots, an outline specification was drawn up, describing the required features. This outline specification was then sent to several yards. One of the proposals, submitted by Cheoy Lee shipyard in Hong Kong, was for the RAmparts 3000 design by Robert Allan. After careful consideration, this proposal was accepted as meeting most of the criteria and being most appropriate for the conditions in Weipa. Even better, the builder was happy to modify the vessel to fine tune and suit the customer's needs.

Cheoy Lee is based in Hong Kong, but has recently sold their Hong Kong construction site to Disneyland and purchased a new site at Doumen on the Pearl River in the Peoples' Republic of China, and these vessels were constructed at the new site.

Rio Tinto is a big company and has stringent OH&S, environmental and wildlife commitments. The vessel as originally configured had 130 m^3 of fuel oil in tanks, much of it at the side of the vessel. This was reduced and reconfigured so that all fuel oil was removed from the sides of the vessel, except for one double-bottom tank on each side of the vessel and a fuel-oil overflow tank (which is usually empty anyway). It would therefore be quite difficult to actually rupture a fuel tank. All fuel oil tanks go to a common overflow, so it would also be difficult to overflow during refuelling operations. The resiting of fuel tanks has meant that the vessel has optimal trim and draft aft, irrespective of the level of fuel on board.

There are five cabins on board, but the vessel operates with a crew of three in harbour. The master's cabin is on the main deck, and other cabins below the main deck. The machinery control room (MCR) is also on the main deck, meaning that the engineer has quick access during operations (when he is usually in deck).

Weipa has a wet-weather season, so on entry into the deckhouse through the aft bulkhead, there is a generous "wet room" which includes wash-up and laundry facilities, as well as wet-gear storage. The same lobby area provides access the engine room, so the arrangement provides a useful noise barrier between the machinery space and the accommodation.

Moving the MCR up to the main deck has left room for a workshop area and store in the engine room, and decreasing the number of cabins forward has left room for a large store forward.

The general consensus is that they have chosen a modern, efficient design which suits the port of Weipa well. Principal particulars are as follows:

Length OA	30.25 m
Beam moulded	11.00 m
Depth moulded	5.28 m
Draft maximum	4.85 m
Fuel Oil	78 m^3
Potable water	26 m^3
Sewage	3.75 m^3
Oily Bilge Water	7.0 m^3

The vessels were built and classed to Lloyd's Register ✠100 A1 Tug, Fire-fighting Ship 1 with waterspray, ✠LMC, UMS.

Vessel Features

The propellers are handed, rather than both turning the same way, and turn inwards when running ahead, or outwards when running astern. This arrangement provides better overall performance, as it minimises the difference between ahead and astern bollard pull. The vessels achieved 59 t ahead and 55 t astern. The propellers are coated with Intersleek, a vinyl-based product from International Paints. There has been little drop in fuel economy or bollard pull, and it means that the vessels will be able to go for five years without docking. The water flow to the propellers in the astern mode is excellent, due to the shape of the stern; the double chines are continued in a big sweep around the transom for this purpose.

The skeg has been sized, shaped and positioned to give good directional stability, both ahead and astern. Robert Allan (the man himself!) was walking around the yard with Neil, inspecting construction, and asked about the exact duties of the vessel? When he found that escort duties were required, but would be rare, his (RA's) advice was to remove two frame spaces from the aft end of the skeg to reduce interference to the flow in the shiphandling mode. This they did, and are pleased with the result. On trials, they achieved 3–4 kn side-stepping (moving sideways), and improved the performance.

Cooling of everything is by way of two box coolers on each side of the vessel, mounted over and inboard of the chines. The inlets are in the bottom plating, and flow is by thermal siphon to the outlets on the sides. This way, there is no salt water inboard of the engine room envelope, and minimises maintenance. The forward cooler on each side is for the corresponding main engine, and the aft ones are for the clutch, thruster and steering. Cooling for the winches is via the skeg cooler. The tops of the box coolers are inclined up and out at 5°, and this means that they vent naturally to the deck. They can use the ballast pump to circulate water from one cooler to the other if they have been five years without docking and the coolers have lost efficiency through marine growth. There are no sea valves to open or close, and there are only six sea valves in total for the whole vessel. There is no sea water piping, and few anodes, cutting maintenance costs.

The escort notation for the vessel can be achieved in one of two ways; by the Glosten Associates in the USA doing a computer simulation of the vessel's manoeuvring characteristics in escort mode (which is accepted by the classification societies), or by the vessel towing a bulk carrier around for two days and surveyors viewing the behaviour in escort mode. They used the Glosten Associates route, and provided the notation requested by Rio Tinto.

The vessels are powered by twin Caterpillar 3616B DITA (direct injection, turbocharged, aftercooled) diesels rated 1685 kW at 1600 rpm MCR, each driving a Rolls-Royce US 205 Z-drive with a 2.40 m diameter propeller through a Twin Disc slipping clutch and a straight-line shafting system. Similar engines are in use in Weipa on shore, and Caterpillar have a competent agent based in Weipa. Fewer people are now being trained as marine engineers, and more are taking advantage of the 1200 rpm rule. If the engines on board a vessel rotate at more than 1200 rpm, then the power of only one engine is taken as the power controlled; however, if the engines rotate at 1200 rpm or less, then the power of the engines is summed to determine the power controlled. Caterpillar engines are easy to install and are now common in tug installations. These are flexibly mounted to reduce vibrations and have electronic control. The engine-room air intakes are on the aft end of the house structure, on either side of and close to the centreline access door.

The vessel has fire-fighting (Fi-Fi) capability, with the pumps driven by the main engines through Twin Disc step-up gearboxes, from 1600 rpm at the engines to 1800 rpm at the pumps. The pumps supply water at 12 000 m^3/h to a pair of remote-controlled monitors forward. There is also a Fi-Fi foam capability, carried in a 5000 L independent stainless steel tank. Gland seals were specified for the pumps, rather than mechanical. Mechanical seals are OK if they are being used often, but gland seals are more reliable for rare use. The valves for the system are remotely controlled from a touch-screen panel or from a wandering lead in the wheelhouse.

The main control console in the wheelhouse is split, with the master standing between the consoles. This arrangement was finalised by mock-ups on site, and has resulted in a user-friendly layout. The ASD (azimuthing stern drive) units are controlled by split combi-levers, one lever for each side and maintain directional control, clutch and throttle. They are harder to train on but, in the hands of an experienced operator, the tug can sit up and sing.

The winches were specified as Kraaijeveld from The Netherlands and are double-drum units with a load cell on the brake and a preset adjustable brake release. The operator can set the brake to release in a controlled manner when the tension reaches a preset limit, say 100 t. The winches are clean, with little external piping. Each side of the winch has the capacity for 110 m of 80 mm synthetic hawser. The winch mounting feet sit on the deck, with all the heavy structure under the deck, so there is minimal maintenance above deck. There is a big towing eye on the foredeck and on the aft deck and the structure is so strong that the vessels could probably be lifted up by either eye!

In Weipa, the operation is critical in the supply chain, as there is only a small stockpile of bauxite. Grounding of a vessel would block the channel and hold up operations, so they have fitted a towing winch on the aft deck as well, as backup. The aft winch has the capacity for 220 m of steel wire, and this feeds through a large aft bitt which in turn supports a 55 tonne SWL radial-arm tow-hook. The towing suite is completed by a set of hydraulic tow-pins built into the aft bulwarks. Weipa is in a remote area, located on the north-west coast of the Cape York Peninsula, and salvage is many days away. However, if the aft winch is used once in twenty years, then it will have paid for itself.

Construction

The hull was constructed in twelve separate blocks, with a small amount of "green", and the blocks brought together and welded. The blocks were constructed upside-down to maximise the amount of down-hand welding. The accommodation block was lifted on after launch, and fit-out continued with the vessel afloat. The first plate was cut on 11 October 2006, and the first vessel was launched on 27 May 2007, and handed over 12 October 2007, a total time of 1 year and 1 day!

The engine-room bilges were painted white; this keeps the space feeling light, and it is easy to see leaks.

In the fit-out of the wheelhouse, Neil placed the thrust-direction indicators up high where they can be seen easily. The mullions between the windows were painted with a matt blue finish to reduce the reflected glare in the wheelhouse. This improves the comfort for the master, who spends the whole day there.

The vessels were trialled in the Pearl River, for all except bollard-pull and anchoring trials, which were done in Hong Kong. On speed trials, they achieved 13.75 kn ahead, and 13.38 kn astern, with the vessels showing excellent directional stability, principally due to the form of the skeg. Sound levels were all in the range of 60–70 dB(A). Under

full bollard-pull condition, the sound level was 63.8 dB(A) in the wheelhouse, with no discernible vibration; not even the handrails were shaking!

The fire-fighting trial was great fun, squirting water everywhere at 12 000 m^3/h while doing 9 kn and not exceeding 80% on the Caterpillar engine load readout!

OH&S is extremely important to Rio Tinto, and they employed a full-time Safety Officer in the yard during construction. This officer was competent, took a leading role rather than standing back and was, in addition, a good front-line interpreter to the Chinese workers. As a result, there were no lost-time accidents, and much of the credit is due to him.

Trials in Hong Kong

Bollard-pull trials were conducted at Hong Kong United dockyard in water of 13 m depth at the end of 300 m of wire which was handled by a gooseneck crane. They expected of the order of 56–57 t. In the event, on the first vessel, *Harry Evans*, they achieved 59.65 t ahead, and 55.72 t astern. On the second vessel, *Peter Crooke*, they achieved 58.57 t ahead and 53.59 t astern.

Conclusion

Harry Evans was the geologist who discovered the deposit of bauxite at Gove, and Peter Crooke was an early manager with Rio Tinto at the site, both of whom have now passed away. There is a plaque in the wheelhouse of each vessel explaining the antecedents of the vessel's name. Peter Crook's widow and family were taken on board the vessel in Weipa.

From the start of the process to delivery took a total of about four years.

Both vessels began service in Weipa within a few days of arrival in the port. They have good consoles in the wheelhouse, and good visibility of the equipment and for readouts. The height and spacing of the consoles is good.

There is a high standard of fit-out. The reduction in the number of cabins forward means that the cabins are of larger-than-normal size, and there is also space for a good-sized store forward. There is a stainless-steel galley which is well equipped. The mess has TV, video, etc. and is well appointed.

The engine room is very spacious, as moving the MCR up to the main deck freed up quite a bit of space.

There is a Palfinger articulated crane on the aft deck for multi-purpose use.

Questions

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

Cheoy Lee's bollard-pull trial involves writing down the load-cell read-out manually every ten seconds, and then taking the average after the required period of time. Each trial was witnessed by an LR surveyor, and the load cell had a digital read-out in tonnes to 3 decimal places, with a test certificate. The pulls achieved by the two vessels differed by a little over 1 t ahead and 2 t astern.

Towing will mostly be done lashed-up over the bow in push-pull mode in Weipa. The aft winch is there as a backup, to ensure that a vessel going aground can be removed before the tide falls.

No trials were done on the vessels in the indirect mode. The escort notation was obtained via the Glosten Asociates computer-modelling route, and they received a lot of drawings and graphs from GA showing the forces applied in the indirect mode. It turns out that the escort mode is not graded, and tugs of any size, from smallest to largest, receive the same "escort" notation. This may have to change!

Fendering comprises a fairly typical array of 800 mm diameter cylindrical upper fender, above a row of "W" section fenders forward. The sheer line aft is protected by "D" section rubber fendering and, in between, the fo'c'sle sides forward and midships are protected by a row of aircraft tires.

If he was doing this again, Neil would improve the fendering. He knows one crowd who build dreadful tugs, but incorporate the best fendering he has seen. They have two cylindrical fenders forward, with chain running through and connecting to lugs on the side of the vessel. The cylinders roll up and down with the movement against a ship, but does not cut the fenders and works really well.

The vessels have only one anchor ready for use. Neil has previously questioned the classification societies about the necessity for having two anchors, when they never use them. For these vessels, LR accepted that only one had to be ready for use, but the second anchor is carried on deck at the side of the house structure on the opposite side to the ready anchor. However, in view of having only one ready for use, LR restricted the operations of the vessels to within 30 n miles of the Port of Weipa. Rio Tinto accepted this restriction, as they felt that trying to rig the second anchor at sea (in the event of a problem with the one), would probably kill someone.

Weipa is in a cyclone-prone area, but there were no special arrangements made on board for cyclone preparedness before delivery. Presumably Rio Tinto have catered for this possibility in the port itself.

Neil's presentation was illustrated throughout with plenty of slides and photographs.

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

Incat's 112 m Wave-piercing Catamarans

Stuart Friezer, Principal of Stuart Friezer Marine, gave a presentation on *Incat's 112 m Wave-piercing Catamarans* to a joint meeting with the IMarEST attended by 35 on 7 May in the Harricks Auditorium at Engineers Australia, Chatswood.

Introduction

Stuart began his presentation by saying that the design of the 112 m vessels was undertaken by Gary Davidson and Tim Roberts of Revolution Design and himself. Design work started in 2001, with the first vessel being launched in 2007. This was a long design-and-build period, associated with a downturn in the fast-ferry industry, but was finally given the go-ahead. The move from 98 m to 112 m was a quantum leap, and the larger vessels have an extra vehicle deck. Beside the new vessels, the previous vessels look small.

The new vessels have an increased payload and can take higher axle loads, allowing them to cater for the military

options which cannot be handled by the previous vessels. The manoeuvrability of the new vessels has been improved, and the structure has been upgraded for all open-ocean conditions.

One of the considerations is the thickness of aluminium plating: the 98 m vessels had 40 mm plating on the portal top and 38 mm plating for the keel. The cost per tonne increases significantly for plating thicknesses in excess of 40 mm. Local-strength considerations also enter the picture, as the slamming loads increase. On the new vessels they have used predominantly 5383, a high-strength aluminium alloy which has 15–20% greater strength than the more-usual 5083 alloy. Minimising build cost is a primary concern.

Evolution of the 112 m Design

The structure of the 112 m vessels has evolved from fifteen years of operational experience on the 74–98 m vessels, and the rigorous operational testing of commercial-type craft by the US military has provided positive results. The structure has been fully optimised, based on this operational experience which provided benchmarking for numerical analysis using known loads. Hydrodynamic analysis was used to determine the wave-induced global bending and torsional moments.

The open-plan architecture enables easy re-configuration for differing operational roles. The vessels also have increased survivability, as they were designed for operation in significant wave heights of up to 13 m. The vessels have been designed around today's lightweight diesel engines and waterjet propulsion, combined with lightweight but robust aluminium structure. Today's diesels typically operate at fuel consumption rates of less than 190 g/kW/h, and waterjet propulsion systems have, likewise, recently made significant gains in efficiency.

Design Considerations

The design concept was for a wave-piercing catamaran capable of carrying a payload of 1000 t at a speed of 40 kn, with the ability to carry 1500 t in the overload condition but at reduced speed. This also gave the ability to increase the deadweight without an increase in footprint or the deadweight-to-lightship ratio.

The new vessels were given a 20% increase in beam while catering for higher axle loads than the 98 m vessels. This gave 1400 m^2 of usable deck area, compared to 1000 m^2 on the 98 m vessels. There is 2000 m^2 of usable deck area available for smaller vehicles, using a combination of fixed and hoistable mezzanine ramps. The axle load permitted on the ramps is 2 t, compared to 0.8 t on the 98 m vessels, so the ramps can now take a HMMWV.

There are six large fuel tanks, holding a total of 800 t of fuel and giving the oprator a large amount of flexibility for the control of trim. The vessels have a range of 4800 n miles at 37 kn carrying a payload of 700 t.

Manoeuvrability and Efficiency

The concept demanded the best combination of ship size and weight compared to efficiency and use. The final hull shape was the result of extensive research: they investigated how changes of wetted surface area, transom immersion and trim affected the total resistance at differing load conditions. Hydrodynamic analysis led to an increase in the spacing of the demihulls and the selection of waterjets with steep thrust curves.

The new 9000 kW diesel engines represent the latest technology for medium-speed diesel engines. With a planned upgrade, these engines could realise an increase to 10 000 kW (10 MW) per engine, allowing higher speeds to be achieved.

The payload transport efficiency (TE_p = Payload×Speed/Brake power) for the new vessels is 57%, compared to 40% for the 98 m vessels.

The large length/beam ratio provides an easily-driven hullform which has been developed for minimum weight and high payload transport efficiency. The minimum immersed volume of the demihulls provides good course-keeping ability, while the ride-control system is integral with the design. Large vehicle-deck areas give a large amount of flexibility in the arrangement, and the shallow draft is attractive to the military and commercial operators, and there are no underwater protrusions.

Manoeuvring has been improved. There is low volume in the demihulls, and high volume in the centre bow which provides the reserve buoyancy, prevents large slams, locates the centre T-foil and protects the wet deck.

Hullform

The demihulls have a fine entry, shallow draft, and there are no appendages. It has been found that over-fine entry leads to excessive viscous resistance, and over-full entry leads to excessive wave-making resistance. The optimum balance seems to be in the region of 5.5–6°. Some competitors put large rudders on their vessels; Incat don't, but they do incorporate mini skegs.

Military Applications

Development of military applications began in 1995, when the Australian Government chartered Hull 045 as HMAS *Jervis Bay* to provide help in East Timor.

Three vessels were subsequently chartered by the US military, commencing with the 96 m *Joint Venture* (ex *Devil Cat*) which was converted for their use by the addition of a helicopter deck. However, the various branches of the military were all claiming use of the vessel, and this led to the US Army chartering the vessel *Spearhead* for their own exclusive use. This was followed by the US Navy commissioning their own vessel, *Swift*, which is still on charter to them (the only one of the three). The Navy have packed her full of recording equipment which is giving some very interesting information. It shows that the vessel is achieving high speeds and is efficient, among other things.

Survivability

The highest significant wave height for designs of previous high-speed craft has been 5 m. However, the significant wave height for the RO notation by Det Norske Veritas is 13 m, and this was the aim. The design loads generated by the complex shape of the centre bow are highly non-linear in magnitude and direction. Conventional codes and analysis procedures cannot predict the interaction and response accurately. So Incat contracted DNV to use their Wasim (wave simulation) code to predict the loads and, in particular, the pitch-connection (twisting) moment. The sagging case is usually worse (provides higher moments) than the hogging case.

An increase in payload could be achieved provided that sufficient strength was added in the right areas without compromising weight. A large increase in ship girder depth was introduced for the first time in wave-piercing catamaran design, allowing the incorporation of an additional vehicle deck. Here Stuart showed a typical midship section, with the hull girder optimised for structural strength and an increase in the overall vehicle deck height.

The separation of the demihulls was increased by 4 m over that of the 98 m vessels as a result of the seakeeping investigation, and the hull beam was also increased. This reduced the transverse accelerations by 25% and the vertical accelerations by 15%, and the roll angle was also reduced. An increase in separation of the demihulls by 8 m over that of the 98 m vessels was also investigated, but that would have prevented passage through the Panama Canal, and was rejected for that reason.

The seakeeping investigation also considered the tunnel height and the shape of the bridging structure, and a slide comparison of the 98 m and 112 m shapes showed the new tunnel to be slightly higher and significantly wider, essentially to allow passages in higher sea states. It was not practical to raise the tunnel height significantly due to the requirements for vehicle loading and unloading operations. The motion-sickness incidence (MSI) for 2 h exposure in 3 m seas is 3.8%, compared to 5.3% for the 98 m vessels.

Longitudinal Strength

This turned out to be one of the biggest problem areas, and they investigated a number of solutions. The 98 m vessels had thick aluminium plating (40 mm and 38 mm) at the portal top and at the keel, and cost analysis suggested that the maximum economic thickness was 40 mm, due to the exponentially-rising cost of welding plates of higher thicknesses.

They investigated:

- a conventional flexibly-mounted superstructure, similar to the 98 m vessels;
- a fully-rigid superstructure;
- a flexibly-mounted superstructure but with the side hull extending to the roof height; and
- no overhead structure, and with all the strength in the bridge-deck structure.

To investigate these options, they created a finite-element model of the midship section, and extruded this for the full length of the vessel.

With the fully-rigid superstructure model, they found that shear lag reduces the benefit, and there is little flexibility for reconfiguration, incorporation of a helicopter deck was especially difficult, and large windows were needed.

With the structural side hull extension, they found that 40 mm plate would be required at the portal top, but 50 mm would be required at the keel.

With the structural bridge deck, they found that the depth of the bridge structure increased so much that it could become a vehicle deck, and would require 50 mm plate athe keel, and 85 mm at the portal top!

The conventional structure was finally chosen, with 40 mm plate at the portal top and 38 mm at the keel.

Structural Design

Various alternatives were investigated to handle the torsional loads

- all cross bracing from transom to bow (this was light and provided good access to services);
- aluminium plate and stiffening from transom to bow (stiff, but heavy and no access to services); and
- a hybrid of the two, with plating forward and aft, and cross-bracing in the middle section (this provided access to services in the critical areas).

The hybrid solution was eventually chosen as the best option. It increased the height of the portal top, increased the overall depth, increased the section modulus, and led to a maximum thickness of plating in the portal top of 40 mm, which was ideal.

They then created a detailed finite-element model of the whole vessel.

Final Configuration

Market research had showed an increasing potential need for carriage of freight, and so the 112 m vessels were refined to include a fixed upper deck. There is a very high lower

The 112 m *Natchan World* (Incat 065) emerging from her building hall in February 2008
(Photo courtesy Incat Tasmania)

deck and, with the fixed upper deck there is no need for cross-bracing in the superstructure. Tier 2 is the strength deck for transverse global loads, and access for services is retained.

The new vessels have a 20% greater operational window with the RO certification, a 25% increase in payload transport efficiency and a 50% increase in axle loads over the 98 m vessels. There is a reduction in the incidence of motion sickness, an increase of 30% in the deck area, and an increase of 100% in deadweight in the overload condition (at reduced speed). Strict attention was paid to weight reduction through a series of design studies on the global and local structure. There is approximately 1000 t of aluminium in each vessel, and so saving weight also meant saving construction cost.

These are innovative vessels which are now setting the benchmark for development in high-speed vessel technology. The risk is low, based on multiple vessels of similar configuration which have been built previously, from the 74 m vessels onwards.

Principal Particulars

Principal particulars of the 112 m vessels are:

Length OA	112 m
Length WL	106 m
Beam (demihull)	5.8 m
Draft	3.9 m
Passengers	800+
Trucks/cars	Depending on configuration
Engines	4 × 9000 kW
Waterjets	4 × Wartsila LJX series
Speed	40 kn

The vessels use an MES slide-type evacuation system, and each vessel has to demonstrate that all persons on board can be evacuated in not more than 17 min.

The engines consume less than 190 g/kW/h, and have less than 10 g/kW/H of emissions.

The Wartsila LJX series waterjets have a higher mass flowrate than the previous LJEseries and, as a result, have a huge margin against cavitation.

Performance

Trials of the first two vessels, *Natchan Rera* and *Natchan World*, gave speeds of 45.4 kn with 240 t of deadweight, 41.7 kn at 600 t and 38.3 kn at 1000 t, all at 95% of MCR of the engines.

Natchan Rera was able to stop from 42 kn in a distance of 720 m, and her turning circle diameter was 630 m, with a speed of 20 kn on exit. Trial speed astern was 8.5kn.

Construction

Stuart then showed a series of slides which were taken at various stages of construction and on trials. Some interesting points emerged:

The pillars on the vehicle deck are of steel to obviate the need for fire-protective cladding on them. The first two vessels required the installation of escalators from the vehicle deck, and these were also of steel and very heavy, providing headaches for the design team!

The side plates on the hulls were left off so that items of fit-out could be inserted through the sides. In particular, the engines were inserted this way, and delivered as late as possible to minimise the financial outlay.

Semi-structural bulkheads were all constructed of 3 mm aluminium plate, and the superstructure itself is resiliently mounted to the hull.

The T-foil could not be fitted to the vessel prior to launch, due to the configuration of the dock. It was therefore floated out on a barge, and fitted up under the vessel when afloat.

Questions

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

The ramps to take the M1 battle tanks were big and heavy, of the order to 10–20 t each.

Fatigue life of aluminium alloys is dependent on the welded strength. The 5383 alloy is better than the conventional 5083 in this regard, having higher strength, and an *f* factor of 0.64 where 5083 has 0.59, i.e. an improvement of 8.5%. Conventional welding was used, rather than high-current welding. Straight sections were all welded by automatic welding machines.

Various propulsion alternatives were assessed, including waterjets and propellers. Waterjets are more efficient at some speeds, and propellers at others, with waterjets being chosen for this application.

Various construction materials were also investigated, with aluminium still being lighter than steel at this length of vessel. Composites would require the use of carbon fibre, and would not meet the structural fire protection requirements.

The engines have a mass of about 140 t, compared to the lightship of 1400 t, and so amount to about 10% of the lightship.

Gas turbines were also investigated, but they are a tough proposition. They have better fuel efficiency as the size increases, but are not as efficient as diesels. The cost of fuel is increasing, and we are all becoming more environmentally aware. The gas turbines themselves are lighter for the same power than diesels, but they require ducting and air-handling equipment, and so there is not as much weight saving as commonly believed.

On the design team they have four engineers/naval architects, with a research-and-development engineer, plus five structural and eight engineering drafters.

Each vessel is fitted with strain gauges for trials, and recording is begun above a given significant wave height. One previous vessel fell off a wave in Cook Strait in New Zealand, and the recordings showed some scary load figures. As a result of that experience, they have spent a lot of time and money on rogue-wave analysis.

The T-foil deploys down and forward and retracts up and aft on a transverse pivot, which also changes the angle of attack. Due to the substantial loss of speed (2–4 kn) the foil is only deployed when required in rough sea states, or about 20% of the total operational time. The foil can be lowered at a speed of 25 kn and, in the event of a strike, a pin shears and activates automatic retraction of the foil.

The vessels are not fitted with interceptors.

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

Phil Helmore

COMING EVENTS

NSW Technical Meetings

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

The program of meetings remaining for 2008 (with exceptions noted) is as follows:

4 June	Michael Mechanicos, Germanischer Lloyd *Ship Classification Societies within the Safety Care Regime*
2 July	Simon Robards, NSW Maritime Authority *Resistance of High-speed Transom-stern Craft*
6 Aug	Robert Dane, Advanced Technology Watercraft *Hybrid Propulsion for Ferries*
19 Aug	Alston Kennerley *The Four-masted Barque* Passat NB Tuesday NSW Sports Club, 10–12 Hunter Street, Sydney See below for further information
3 Sept	Adrian Broadbent, Lloyd's Register Asia *Classification of the RAN's New Navantia-designed LHDs*
1 Oct	Eric Clarke, MAN Diesel *51/60 Dual Fuel Engines for LNG tankers*
4 Dec	SMIX Bash 2008

Put these dates in your diary now, and we look forward to seeing you there.

Marine Safety Conference 2008

The National Marine Safety Committee will host the next national Marine Safety Conference at the Hilton Adelaide hotel in Adelaide from 27 to 29 May 2008. This is the fifth two-yearly Marine Safety Conference organised by NMSC. In 2006, the event attracted 350 delegates and 50 national and international speakers.

The Conference will deal with a wide range of current issues impacting on the marine industry, and covering the following sectoral interests:

- Recreational Boating
- Commercial Operations
- Seafood Industry
- Engineering
- Boat/ship Design and Building
- Training
- Safety and Environmental Management
- Surveying
- and more specialist topics.

The program is now up on the conference website at www.nmsc.gov.au/msc_microsite/media/documents/conference_program.pdf.

For further information, visit the NMSC website at www.nmsc.gov.au and follow the link, phone the NMSC Secretariat on (02) 9247 2124, or email secretariat@nmsc.gov.au.

The Four-masted Barque *Passat*

This presentation to RINA (NSW Section), IMarEST (Sydney Branch, the Company of Master Mariners of Australia and the Nautical Institute will be made by Alston Kennerley, on Tuesday 19 August at the NSW Sports Club, 10–12 Hunter Street, Sydney.

Passat at Travemunde in 1980
(Photo John Jeremy)

Alston Kennerley was born in 1935 in Liverpool. He came from a seafaring family (mother a clerk with Blue Funnel, father RO with Holts, including 4 years in *Charon* in WWII; grandfather and great grandfather were ship's masters). After a primary education in Australia (Richmond School in East Fremantle) and a secondary education in England, he entered the service of the Liverpool shipowners, Alfred Holt & Co. (the Blue Funnel Line) in 1951, as midshipman (deck apprentice), subsequently serving the same company as deck officer. His apprenticeship started with ten month's service as a cadet aboard the German four-masted barque *Passat*. In 1961, he obtained his master's certificate, having studied in Liverpool.

After reading history at the University of Wales, and a course in education, he became a lecturer in Plymouth, teaching navigation, education, maritime information and maritime history, and developing his research interests in maritime educational and social history. In the 1970s he became involved in the early development of maritime English courses for English-language teachers. He retired from his position as Principal Lecturer in the Institute of Marine Studies at the University of Plymouth in August 2000 having, for many years been in charge of maritime undergraduate courses and subject leader for Maritime History.

In 1977 he was elected a Fellow of the Nautical Institute for services in the field of maritime information. In 1991 he was awarded a Winston Churchill Travelling Fellowship and, since 1991, has been an Honorary Fellow of the Centre for Maritime Historical Studies at the University of Exeter.

This presentation is in addition to those previously programmed, and those wishing to attend are requested to note the change of day to the Tuesday, and the change of venue to the NSW Sports Club, , 10–12 Hunter Street, Sydney (in the CBD). Times remain as usual; 6:00 pm for light refreshments (tea, coffee and biscuits) and a 6:30 pm start.

The venue is on the 4th Floor of the Club building. All guests will be asked to sign the Club's visitor book. There will be

a nominal charge of $5.00 per person (payable at the door) to cover venue hire and light refreshments.

In order to provide numbers for catering, if you plan to attend could you please call Phil Helmore on (02) 9385 5215 before noon on Friday 15 August 2008.

Basic Dry Dock Training Course

This popular RINA training course will be held for the first time in Australia on 18–22 August at Tenix Marine in Melbourne. This four-and-a-half day course covers the fundamental principles and calculations of dry docking. The course will be presented by Mr Jack Brown. Further details of the course are on the RINA website at www.rina.org.uk/basicdrydockaustralia, the program and registration for may be downloaded from there.

Ausmarine 2008

After a number of very successful showings in Fremantle, Cairns and Brisbane, the well-known marine trade show Ausmarine will be presented in Sydney for the first time at the Sydney Convention and Exhibition Centre from Tuesday November 11 to Thursday November 13.

Focussed very clearly on commercial and government ship and boat owners and operators, Ausmarine is a very practical exhibition and conference for practical mariners.

Ausmarine 2008 will be the eighth showing since 1994. "Ausmarine has now been held in four Australian maritime cities over fourteen years," said orgnaiser Kevin Parker. "We have tried to locate it at the epicenter of commercial marine action in Australia and, at the moment, Sydney is very definitely that centre."

Covering all kinds of commercial and government vessels, Ausmarine will include ferries, tugs, cruise and dive boats, patrol and rescue boats, fishing and aquaculture boats, OSVs, cargo ships, tankers and work boats. Every aspect of their activity from design, construction, propulsion, navigation, fish finding, paints and coatings through to fuel and lubricants, insurance and finance, will be covered.

For further information, contact Baird Events on (03) 9645 0411, fax 9645 0475, email marinfo@baird.com.au, or visit the website www.baird-online.com.

HPYD 2008

The third High Performance Yacht Design conference will be held on 2–4 December 2008 in Auckland, New Zealand. Following on from the success of the last two conferences, papers are now invited on a broad spectrum of topics covering the design of high performance yachts and power craft:

- Performance prediction and measurement.
- Wind tunnel and towing tank technology.
- Regulations and rating rules.
- Computational methods.
- Materials and structural analysis.
- Hull and appendage design.

Abstracts of papers proposed for the conference were due in by 31 March so, if yours is not in yet, then you have missed the boat, so to speak.

The conference organizers will be sending out regular updates by email, so you may subscribe to their update list now to keep up to date with progress.

Check out all the current information, including details of previous conferences, at www.hpyd.org.nz.

IHSMV 2009

The first International Conference on Innovation in High Speed Marine Vessels is being organised by the Royal Institution of Naval Architects in Association with Curtin University of Technology, and will be held in Fremantle on 28–29 January 2009.

Few sectors of the maritime industry have embraced innovation as readily and successfully as the high-speed marine vessels sector, in seeking to extend operating envelopes, reduce downtime and increase reliability, safety and comfort, and reduce costs. Advanced design, the use of new materials and more-efficient production methods and other means have been, and are, all being explored to achieve these aims for commercial, military and recreational vessels.

The first International Conference on Innovation in High Speed Marine Vessels will provide an opportunity for all those involved with this sector of the maritime industry to present and discuss recent and future developments in all these aspects of commercial, military and recreational high-speed vessels.

Technical papers are invited containing new and original ideas, innovative applications and practical achievements in various aspects of high-speed marine vessels including, but not limited to, the following topics:

- Design and construction: including monohulls, multihulls and special craft, such as ACVs, SESs, SWATHs and hydrofoils.
- Coatings, materials and manufacturing processes, including nanotechnology.
- Research and development: Including model testing, hydrodynamics and structural response.
- Operations: including wake and wash implications, propulsion machinery, motion control, seakeeping and human factors.
- Safety, regulation and classification.
- Equipment.

The call for papers is now out, and prospective authors are invited to submit an abstract of no more than 250 words.

For further information, submission of an abstract or registration of your interest in attending, contact conference@rina.org.uk, or fax +44-20-7259 5912.

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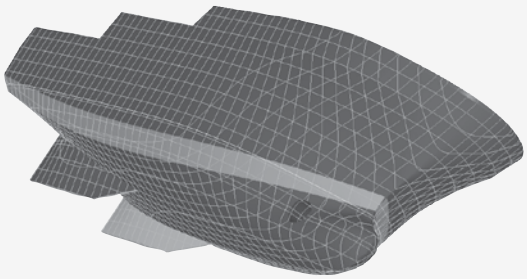

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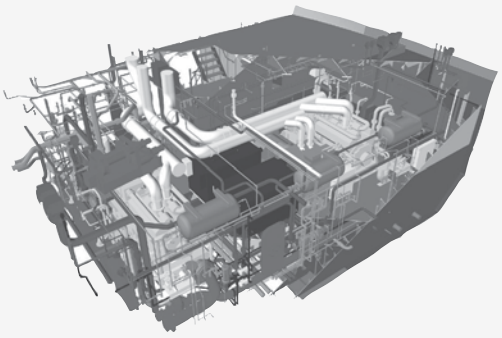

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CLASSIFICATION SOCIETY NEWS

DMO and GL sign new Anzac Classification Contract

The Australian Department of Defence and Germanischer Lloyd have renewed their cooperation by signing a contract for the maintenance of classification of the Anzac-class frigates in November 2007. The eight frigates for the Royal Australian Navy (RAN) were brought into GL class in 2002 for an initial period of six years. During this time GL provided the Navy with assurance of ship safety and their systems. This was a world-first achievement, whereby naval combatant ships were granted full class and provided with statutory certificates.

The new contract includes the provision of one additional statutory certificate. The "Safety Equipment Certificate" has been issued to the Anzac-class vessels following a careful analysis of the ships' safety arrangements to establish equivalence with the relevant statutory requirements and in close cooperation with the Naval Flag Authority.

GL's Area Manager for Australia and New Zealand, George Spiliotis, comments: "The Royal Australian Navy has been very professional in dealing with class-related issues. I hope this level of cooperation will be extended to other naval projects."

HMAS *Toowoomba*, one of the eight RAN Anzac-class frigates classed by Germanischer Lloyd
(RAN Photograph)

BMT Defence Services (Australia) and GL (Australia) sign Agreement

On Friday 14 March 2008, BMT Defence Services (Australia) and Germanischer Lloyd (Australia) signed a Memorandum of Understanding (MoU) to cooperate in the area of provision of independent assurance, risk management and support to naval capability.

Germanischer Lloyd Australia is a subsidiary of the German-based Germanischer Lloyd (GL) group. GL is at the forefront of testing, researching and continually improving safety-related factors. For about 140 years GL has been setting standards in technology, safety and quality in the shipping sector. Over the years, the spectrum of services provided has steadily broadened so that GL ceased to be a pure ship-classification society long ago, and is now a globally-operating technical monitoring group with a workforce of more than 4200 and 191 offices in 77 countries.

GL has a wealth of navy experience. Over the last 30 years it has provided support to more than 25 navies covering more than 340 ships and submarines. It is the only classification society which has developed classification rules for naval submarines, and the first one to bring under naval class both combatant ships and submarines.

BMT DS(A) specialises in the provision of ship-design and naval-engineering consultancy services which include design and evaluation capability at the whole platform or system level, systems engineering, safety and environmental management, integrated performance management, whole-life cost modelling and through-life design support for new and in-service ship and submarines.

BMT DS(A) is one of 30 international subsidiary companies which constitute the BMT Group, a leading international multi-disciplinary engineering, science and technology consultancy of around 1000 professional engineers offering a broad range of services, particularly in the defence, energy, environment, shipping and port-logistics sectors.

Under the MoU, BMT DS(A) will utilise GL Naval Rules and Regulations to assure the integrity of BMT products and GL (A) will utilize BMT's expertise and experience in further developing GL's naval rules to meet individual navy needs. Together they will provide risk-management, local support and safety assurances to naval capability.

The combination of the capabilities of these two companies under this alliance brings a new dimension to the area of naval assurance services in the region, with an in-country professional naval engineering presence in excess of 35 staff, with outports in all major maritime centres across Australia and unparalleled reach back to parent-company support.

Michael Mechanicos

DNV Opens New Exclusive Office in Darwin

Det Norske Veritas (DNV) has recently opened a new exclusive office in Darwin. By opening DNV Darwin, DNV is the first classification society to have a permanent exclusive presence in the Northern Territory.

The demand for DNV services is steadily increasing in the NT, particularly within the market sectors of defence, maritime and offshore. The main objective in establishing the Darwin office is to further enhance DNV customer support to existing local clients, while also developing DNV's business generally in the NT. At the moment, DNV Darwin covers ships in operation and offshore activities, with Certification of Materials and Components activities and Maritime/Offshore advisory services.

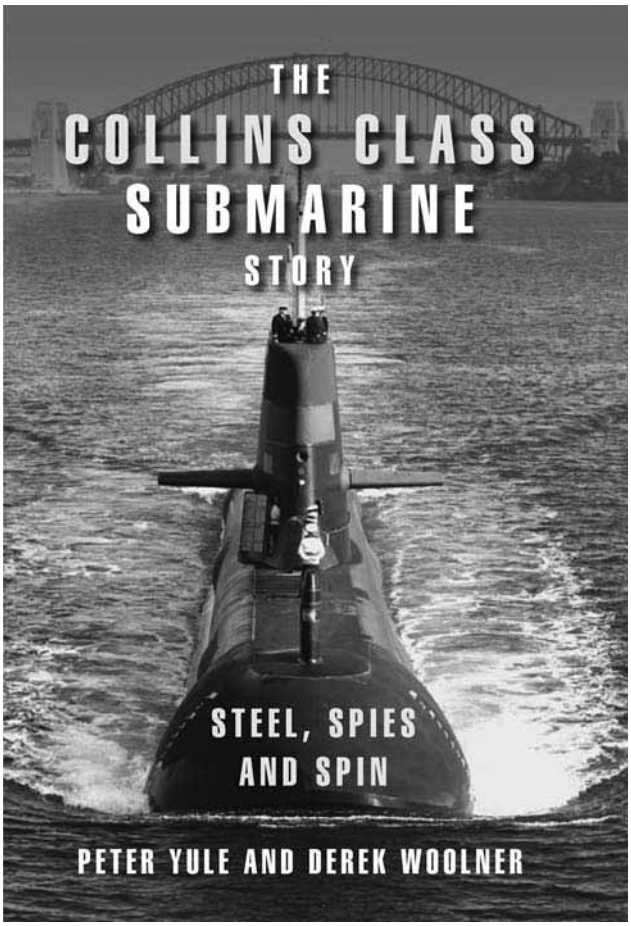
The contact details for DNV Darwin are:

Tony Brogan, DNV Darwin, GPO Box 3696, Darwin NT 0801, phone (0448) 802 290, fax (08) 8941 2787, email tony.brogan@dnv.com.

Tauhid Rahman

FROM THE CROWS NEST

Book on the Collins-class Submarines



Cambridge University Press Australia has launched the book *The Collins Class Submarine — Steel, Spies and Spin*. The book, by Peter Yule, a professional historian, and Derek Woolner, a defence-procurement expert at ANU, is the story of one of the country's largest-ever engineering projects and, in fact, Australia's largest defence-procurement project ever.

The book concludes that, in spite of numerous teething problems and, contrary to popular impressions, Australia has produced some of the finest custom-built submarines in the world. The book, written in a refreshingly engaging style is the story of how this was achieved — what went right, what went wrong, and what lessons for large-scale military and engineering projects can be learned.

The Hon. Mr Kim Beazley, a former Minister of Defence, officially launched the book at the Australian National Maritime Museum at Darling Harbour, Sydney, on 8 April.

Phil Helmore

Fire Suppressant Uses Natural Gases

Wormald has released the Inergen fire-suppressant system which relies entirely on natural gases. The suppressant is a patented mixture of nitrogen, argon and carbon dioxide. This combination allows the system to smother a fire by diluting the oxygen concentration from the usual 21% to around 12.5% — a level at which most ordinary combustibles won't burn.

Unlike chemical systems, the release of the system's natural gases does not result in fogging, consequently allowing anyone in the protected area to safely evacuate while breathing easily. It does not require an expensive exhaust system to remove any suppressant after the fire has been extinguished. With no chemicals, it has no ozone-depletion or global-warming potential, and leaves behind no toxic or corrosive deposits.

Kim Beazley speaking at the launch of *The Collins Class Submarine — Steel, Spies and Spin*
(Photo John Jeremy)

It is designed to extinguish fire without damaging property, such as fragile electronics equipment which could be damaged using a chemical fire suppressant.

Engineers Australia, April 2008

Human Factors in the Maritime Domain

With Tim Horberry of the University of Queensland and Thomas Koester of Force Technology, Denmark, Dr Michelle Grech has recently completed writing a book, entitled *Human Factors in the Maritime Domain*, which was published in March. Michelle works for the Maritime Platforms Division within the Defence, Science and Technology Organisation (DSTO). Her current work involves maritime-focused research on human systems integration and human factors. Dr Grech joined DSTO after completing her PhD in human factors at the University of Queensland in 2005, specialising in fatigue, workload and situation awareness in the maritime domain.

A chartered engineer, Michelle has spent most of her career working within the maritime industry in Malta, the UK and here in Australia, starting off as a project engineer, engineering consultant, marine surveyor and maritime human factors researcher. Michelle has also been involved in a number of European Union (EU) maritime safety projects. She is periodically involved as a maritime human factors expert in the evaluation of maritime research projects for the EU Director General of Transport.

The recently published book

- provides comprehensive overview of human factors issues within the maritime domain;
- discusses a socio-technical network that incorporates human, group, technology, work practice, organization, and work environment aspects;
- outlines relevant human factors knowledge before focusing on topics more specific to the maritime domain;

- covers aspects of cognitive psychology as applied to maritime human factors such as senses and perception, information processing and decision making, and human behavior;
- explores several methods that can be used in the maritime environment to collect human factors data and operator performance information; and
- presents practical examples and case studies.

Human factors describes the psychological and organizational aspects of the interaction between humans and technology, primarily in occupational contexts.

The book provides the vital background information necessary to acquire a core knowledge base and a much-needed overview of human factors within the maritime domain. It starts by putting the topic into an historical and theoretical context, moves onto more specific and detailed topics and contemporary thinking in human factors, then reviews new maritime technology.

The authors take a holistic approach based on a model of the socio-technical system of work in the maritime domain. They synthesise available knowledge and research, then present in an easily acceptable framework with examples, illustrations, and case studies whenever possible, making the text rigorous, useful, and enjoyable.

For more information visit www.crcpress.com.

Dr Michelle Grech with her recently-published book
(Photo courtesy DSTO)

GENERAL NEWS

New Defence White Paper

On 22 February the Minister for Defence, the Hon. Joel Fitzgibbon MP, announced that he has commissioned a new Defence White Paper. He also announced the structure of the White Paper, along with the appointment of the personnel who will be responsible for the development and delivery of this key strategic document.

During the announcement at the Australian Defence Force Academy, Mr Fitzgibbon commented on the importance of the development of the White Paper for Australia's future defence and security.

"The White Paper is a vital planning document which will form the foundation of our future Defence capabilities. We owe it to the Australian people to get this planning right. The White Paper will help the government to make fully-informed and cost-effective decisions about the military capabilities we need to defend Australia and to promote our interests," said Mr Fitzgibbon.

"The White Paper process will result in comprehensive policy guidance across the entire Defence portfolio, delivering on the Labor Government's election undertaking to re-examine Australia's strategic environment. It will align defence strategic guidance, force structure and capability priorities, and resource strategies, by taking a comprehensive view of the Defence enterprise."

Mr Fitzgibbon has also commissioned a series of accompanying reviews (Companion Reviews) to be conducted across a range of Defence areas to underpin the new White Paper. These critical studies will be a key input to developing Defence business and budget priorities out to 2030.

"Production of the White Paper will be led by Defence, and I have accepted the recommendation of the Chief of the Defence Force and Secretary of Defence, that Mr Michael Pezzullo, currently a Deputy Secretary within the Department, assume the role of principal author of the White Paper from 25 February 2008," said Mr Fitzgibbon.

"I have also appointed a Ministerial Advisory Panel to provide me with external advice on key issues associated with the White Paper, and to work with Mr Pezzullo. The Panel, comprising three leading Australian strategists, Professor Ross Babbage, Major General Peter Abigail (Retd), and Dr Mark Thomson, will bring valuable experience to the White Paper process."

Mr Fitzgibbon foreshadowed that there will be opportunities for community participation in the White Paper process.

"The development of the White Paper will include a comprehensive community consultation process to encourage community interest in Defence issues, and incorporate those views into the policy making process," he said.

"I will be announcing the membership of the community consultative panel and details of the community consultation process in the near future."

Dr Stephen Gumley Reappointed

On 2 May the Minister for Defence, the Hon. Joel Fitzgibbon MP, and the Parliamentary Secretary for Defence Procurement, the Hon. Greg Combet MP, announced the ongoing employment of Dr Stephen Gumley as Chief Executive Officer, Defence Materiel Organisation (DMO).

As approved by the Secretary of Defence, Mr Nick Warner, under the Public Service Act, Dr Gumley's employment

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status has moved from a fixed term to ongoing Australian Public Service (APS) employee status.

Dr Gumley's fixed-term contract was due to expire in February 2009; however, the change to employment conditions indicates the Government's confidence and Dr Gumley's commitment to continue implementing the reforms across DMO's procurement and sustainment business.

"Mr Combet and I have been very impressed with the reforms and business improvements Dr Gumley has brought to the DMO," Mr Fitzgibbon said.

"There is still more to be done; however, under Dr Gumley's leadership we are confident that the reform process will continue," Mr Combet said.

The DMO buys and maintains equipment for the Australian Defence Force with more than $100 billion of acquisition and sustainment business currently under management.

The change to Dr Gumley's employment conditions creates stability for DMO's staff and confidence that the clear framework for the agency's priorities and vision will be maintained.

It will also create certainty for the already well-developed relationships with senior industry leaders in Australia and overseas.

Defence Procurement and Sustainment Review

The Hon. Greg Combet MP, the Parliamentary Secretary for Defence Procurement, announced on 7 May that a review of Defence procurement and sustainment will be conducted by Mr David Mortimer AO.

"The announcement of this Review fulfils Labor's election commitment to undertake a formal evaluation of the effectiveness of ongoing reforms to the Defence Materiel Organisation (DMO)," Mr Combet said.

Those reforms were implemented following the 2003 Review of Defence Procurement led by Mr Malcolm Kinnaird AO.

"There have been some high-profile problem projects in the area of Defence procurement and the Government is committed to avoiding a repeat of past problems through an ongoing reform program," Mr Combet said.

Mr Combet, in his role as Parliamentary Secretary for Defence Procurement, has been assigned the task of developing a future program of reform for the DMO by the Minister for Defence, the Hon. Joel Fitzgibbon MP.

"The Review will consider further potential reforms to the acquisition and through-life support of defence equipment. It will also make recommendations on initiatives to further enhance delivery of capability to the Australian Defence Force (ADF) in the most efficient and cost-effective manner," Mr Combet said.

"The Government is fully committed to ensuring that the DMO is subject to continual reforms to improve its efficiency and effectiveness. The reforms underway in the DMO have been working, but this review will highlight areas where more can be done.

"For example, I would like the review to examine how DMO can continue to develop its commercial orientation and become more business-like in its operations.

"The recent reappointment of Dr Stephen Gumley as the Chief Executive Officer of the DMO was critical to the success of the reform program, given his background, experience and performance in this area."

Dr Gumley will be responsible to the Government for the implementation of the future program of reforms within DMO, including any reforms which emanate from this review.

Mr Combet also expressed his thanks to Mr Mortimer for agreeing to undertake the review.

"I am confident that Mr Mortimer is the right person for this job, and I am happy with the calibre of support being provided by the DMO."

Mr David Mortimer AO is currently Chairman of Leighton Holdings and Australia Post. Mr Mortimer has also been the Chairman of the Defence Procurement Advisory Board since 2004 and is ideally suited to lead this Review.

Mr Mortimer will be supported by a Review team headed by Major-General A.P. (Tony) Fraser. Major-General Fraser is currently Head of Helicopter Systems Division in the DMO and has a strong operational background and experience in defence procurement.

It is expected that Mr Mortimer will report to the Parliamentary Secretary for Defence Procurement within a period of 12 to 14 weeks. Mr Combet will then consider the report before making his recommendations to the Minister for Defence.

The review welcomes submissions of up to 10 000 words from interested groups and individuals. The deadline for submissions is Friday 6 June 2008. Submissions should be made through DPS.Review@defence.gov.au.

ASC begins $100 million Shipyard Upgrade

Work on the $100 million upgrade of ASC's shipyard in South Australia began on 7 March 2008. An outdated amenities building was demolished and a more traditional soil-turning ceremony performed to symbolise the beginning of the development — ASC's biggest infrastructure program since the establishment of the Collins-class submarine facility in 1987.

Located adjacent to Techport Australia's Common User Facility, the Osborne shipyard will be used by ASC in its role as shipbuilder in the air-warfare destroyer (AWD) programme.

The upgrade will include state-of-the-art AWD production facilities, new office accommodation for 400 employees and a wharf support building with office space and workshops.

The local construction industry is poised to reap the benefits of the development, with South Australian firm Hansen Yuncken chosen to design and construct the shipyard and numerous spin-off opportunities expected for sub-contractors.

"This is an exciting day in the history of ASC," Managing Director Mr Greg Tunny said. "We have begun to build the shipyard in which we will construct and consolidate three air-warfare destroyers in what is one of the most complex engineering projects ever performed in this country.

"We have already achieved many planning and design mile-

stones for the AWD programme, and now we are getting down to the business of building ships."

The project is expected to create up to 350 jobs at its peak, and be completed in the last quarter of 2009.

New Submarine Facility in WA

On 30 April, the Hon. Greg Combet MP, the Parliamentary Secretary for Defence Procurement, attended the 'launch' of the new ASC West Facility in Western Australia.

The new facility represents an amalgamation of three service facilities into one consolidated state-of-the-art submarine support facility at the Australian Marine Complex at Henderson.

The facility will allow for the conduct of submarine maintenance and capability enhancements to be conducted in an undercover and modern environment.

Mr Combet said the launch was "a pivotal milestone for Australia's submarine community which represented a much-needed and significant step forward, delivering a world-class submarine-maintenance facility in Western Australia."

He said "ASC West represents a major step forward in delivering greater capability and availability, while enabling more-efficient sustainment and better value for money for the Commonwealth."

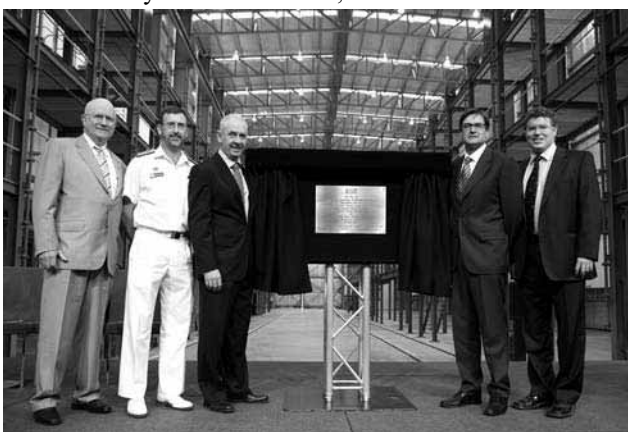
"The billion-dollar Collins-class submarines have, to date, had to be maintained in very difficult conditions, open to dust, sand and weather.

"When ASC West becomes fully-operational next year, ASC will be better equipped to respond quickly to Navy requirements. A quicker turnaround time can only result in a better meeting of Navy's demanding operational requirements for the submarines," he said.

Mr Combet also thanked Alan Carpenter and the Western Australian Government for their significant contribution.

"The common-user infrastructure which is being developed is fundamental to enabling ASC West to exist and undertake submarine maintenance in a dedicated and consolidated state-of-the-art support facility.

"Key enabling infrastructure, including a floating dock, a transfer system and wharf extensions will allow ASC to undertake its submarine-maintenance tasks more effectively and efficiently than ever before," he said.



John Prescott, ASC Chairman; CMDR Rick Longbottom, DSO Director General Submarines; Frank Logan, WA Minister Industry, Resources, Energy and Enterprise; Greg Combet, Parliamentary Secretary for Defence Procurement and Greg Tunny, ASC Managing Director, in the new ASC West facility (Department of Defence photograph)

Floating Dock Progress

Strategic Marine Pty Ltd is well underway with the construction of the $60 million floating dock for the Australian Marine Complex in Henderson, Western Australia with delivery scheduled for mid 2009.

The 99 m long by 53 m wide structure will be capable of providing the land transfer of docked vessels up to 3500 t, with the capacity to lift 12 000 t vessels out of the water for service and maintenance work. WA Planning and Infrastructure Minister, Alannah MacTiernan, said the floating dock was expected to inject well over $2 billion into the State's economy over the next 25 years.

The sidewalls of the dock containing the control systems and running machinery will be constructed in Western Australia, while the base pontoon are being constructed at Strategic Marine's facility in Vietnam and will be transported to Henderson for consolidation with the side walls. Over 1000 t of steel work is scheduled to be completed in Western Australia, as well as the integration of all machinery, electronics and ballasting systems. The local content of the project will be over 60%.

Strategic Marine is riding a huge wave of success, with 124 vessels on the order books, equating to over $245 million in value. Of particular interest is the contract for a 143 m dive-support vessel for Coastline Maritime Pte Ltd of Singapore. This project has enabled Strategic Marine's Vietnam facility to develop the infrastructure and technology to complete large steel construction projects such as the AMC floating dock.

"The AMC project would have to rate as one of the more impressive government contracts in Strategic Marine's history", Chairman Mark Newbold said. Strategic Marine are certainly no stranger to large government contracts, having delivered over 140 patrol vessels to various government agencies around the world, worth over $180 million.

The floating dock project is a key component of the Government's $174.3 million commitment to infrastructure upgrades at the AMC, and will be a valuable addition to Western Australia's shipbuilding precinct.

US Navy Awards Contracts for Zumwalt-class Destroyers

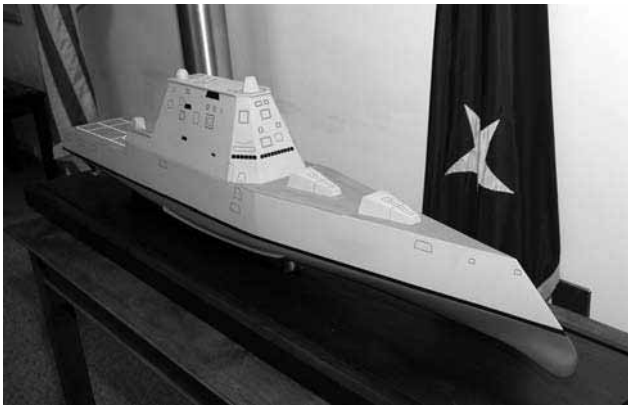
The US Navy has exercised contract modifications for the construction of the dual lead ships of the Zumwalt-class (DDG 1000) destroyers to General Dynamics Bath Iron Works and Northrop Grumman Shipbuilding. DDG 1000 and DDG 1001 are the lead ships of a class of next-generation multi-mission surface combatants tailored for land-attack and littoral dominance.

BIW was awarded a $1.4 billion cost-plus contract for the construction of DDG 1000, and NGSB was awarded a $1.4 billion cost-plus contract for construction of DDG 1001. The Navy and industry are using a thorough design-for-producibility process to pursue every opportunity to reduce cost on the DDG 1000 class without reducing key performance parameters. The Navy's dual lead-ship strategy has reduced cost and encouraged collaboration. This approach will give the Navy information and modifications for future acquisition-strategy decisions, and addresses

congressional concerns regarding maintaining the industrial base.

DDG 1000 has been in design, development and demonstration for almost six years. The Navy has successfully, on cost and on schedule, built and tested the ten critical technologies that provide the capabilities which future ships need. The ship's detail design effort is also on cost and on schedule, and will be more complete at the start of construction next year than any other previous surface warship. This achievement is a testament to the close cooperation between both shipyards, and also between the Navy and industry.

DDG 1000 will triple naval surface fire coverage as well as tripling capability against anti-ship cruise missiles. DDG 1000 has a fifty-fold radar cross-section reduction compared to current destroyers, improves strike group defence ten-fold and has ten times the operating area in shallow-water regions against mines.



The shape of warships to come — a model of the US Navy's new DDG 1000 destroyer
(US Navy Photo)

Austal Launches Littoral Combat Ship

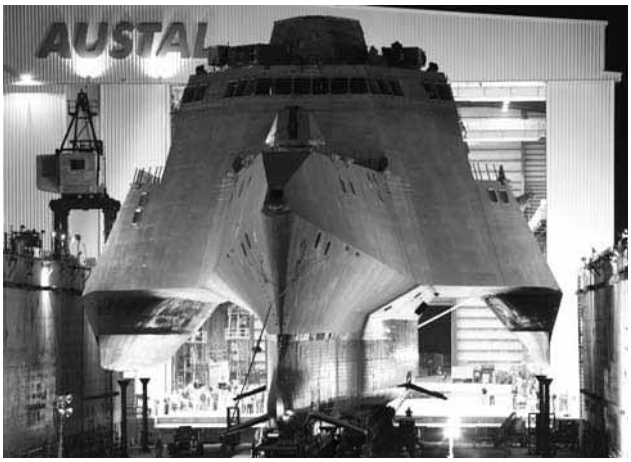
Austal USA launched the 127 m littoral combat ship *Independence* (LCS 2) in what proved to be a momentous occasion for Austal as the company celebrates its 20th year.

Since her keel laying in January 2006, *Independence* has steadily progressed within Austal USA's purpose-built construction facility in Mobile, Alabama, towards becoming a formidable warship.

The launch procedure involved coordination of all large shipping traffic in the Mobile River while *Independence* was rolled out of the construction hall on sixty-six 100 t rail-trolleys onto a floating drydock.

The 127 m Austal trimaran seaframe is the platform for the LCS's mission and weapon systems. This seaframe provides superior seakeeping and aviation as a result of its long, slender central hull and smaller side hulls ("amahs"). The trimaran hullform provides a large internal mission deck with a high payload-carrying capacity.

Located above the mission bay is the enormous flight deck, capable of conducting dual H-60 helicopter operations and accommodating the US Navy's largest helicopter, an H-53, a feature not available on similar-size naval warships. The vertical location of the flight deck on the trimaran hull form provides the highest flight deck elevation on a combatant ship other than a major amphibious vessel or aircraft carrier.



The shape of warships coming — LCS2 *Independence* emerging from her building hall
(Photo courtesy Austal)

Independence will be moored alongside the Austal USA facility while the activation and testing of combat and other onboard systems is completed. Sea trials are expected to commence in late 2008.

In congratulating the workforce on the construction of the vessel and successful launch, Austal USA Chief Executive Officer, Bob Browning, commented "This is an incredible

Independence fitting out in Mobile, Alabama
(Photo courtesy Austal)

achievement not only for Austal but, particularly, for Austal USA which was only established in 1999. To have recruited, trained and developed a strong workforce of over 1000 staff from scratch, who today launched the largest and most sophisticated aluminium warship built to date, is an impressive feat."

Independence is one of two alternative ship designs which will be evaluated by the US Navy as part of its plan to expand the existing fleet to 313 ships. The Navy's current program of record anticipates the construction of 55 littoral combat ships.

Sister Vessel to Record Breaker Launched

Hormuz — the second of two 65 m high-speed vehicle-passenger ferries built for the Sultanate of Oman — was launched at Austal's Henderson shipyard on 7 May.

Scheduled for delivery later this year, the two catamarans will provide a new tourism service to Oman's rugged Musandam Peninsula and will be the flagship in the Sultanate's expanded marine transport network.

Sister vessel *Shinas* achieved a record service speed of 52 kn and a maximum speed of 55.9 kn during sea trials last November, showcasing the world-class ability of the Austal design and construction team.

Once delivered, the vessels will set new standards for the Middle East region, not only in terms of performance but also with regard to safety, comfort and quality of finish.

Austal currently has 15 commercial and defence vessels operating in the Middle East, as well as ten in nearby Turkey, reinforcing Austal's commitment to the unique needs of the region.

As well as reaching speeds of over 50 kn, the ferries carry 208 passengers and 56 cars along an intended 180 n mile route. Passengers will experience unparalleled comfort across three classes — Tourist Class, First Class and VIP. High-quality seating and catering facilities are all located on a single deck, with seakeeping comfort enhanced by the Austal SeaState motion-control system.

Onboard features also include a helicopter-landing facility, which will be capable of assisting in search-and-rescue and medivac operations.

Both vessels are powered by four MTU 20 cylinder 1163 series diesel engines, each producing 6500 kW and driving Rolls Royce/Kamewa waterjets. The vessels are built in accordance with the requirements and under the survey of Det Norske Veritas, conforming to the International Maritime Organisation High Speed Craft code (HSC 2000).

Shinas is scheduled for delivery in June, with *Hormuz* due to follow later in the year.

Fast Patrol Craft Order for Austal

Following the recent completion of Australia's 14-vessel Armidale Class Patrol Boat fleet, Austal announced on 22 April a contract to build six 30 m aluminium fast patrol craft for the Government of the Republic of Trinidad and Tobago.

This significant order includes additional contracts for scheduled and unscheduled maintenance and crew-training services.

The all-aluminium fast patrol boats will support the Trinidad and Tobago Coast Guard in providing sustained surveillance in the country's internal waters, the archipelagic territorial sea and its exclusive economic zone.

Each vessel will have a small twelve-man crew, a maximum speed of 40 kn and will be armed with three general-purpose machine guns and a 20 mm cannon.

All six vessels will be constructed at Austal's facilities in Henderson, Western Australia and are scheduled for delivery by early 2010.

During the construction period, Austal will provide a training programme including familiarisation of vessel operation, ship-based engineer training as well as maintenance training for shore-based support personnel.

Following delivery of the vessels, a five-year comprehensive maintenance and support-services program will be provided by Austal, which will include scheduled planned and preventative maintenance support, unscheduled maintenance, management and performance of annual surveys and maintenance periods as well as shore-based engineering support.

The contract, which was awarded following a competitive international tender process, followed similar vessels

Hormuz ready for launching
(Photo courtesy Austal)

recently delivered by Austal to the Government of Kuwait, the Yemen Ministry of Defence, the Australian Customs

Service and the New South Wales Water Police.

Austal Executive Chairman John Rothwell said "Fresh from handing over the last of the 14 Armidale-class patrol boats to the Royal Australian Navy, this contract confirms Austal's growing presence in the design and construction of modern, fast patrol craft capable of addressing unique maritime security requirements.

"The added provision of a comprehensive five-year maintenance package and crew-training services demonstrates the global support network of the Austal Service Department, which is now a growing business unit within the Austal Group," he said.

An impression of the new patrol boat for Trinidad and Tobago
(Image courtesy Austal)

The fast patrol craft will play a major role in ensuring the safety of shipping, as well as the preservation of the marine environment. The vessels will also target the illegal trafficking of drugs, safety at sea and perform search and rescue duties.

Each patrol boat is to be powered by two MTU 16 cylinder 2000 series diesel engines driving a KaMeWa waterjet propulsion system, allowing a maximum speed of 40 kn and a maximum range of more than 1000 n miles at 10 kn.

Principal Particulars

Length OA	30 m
Beam (moulded)	6.4 m
Hull Draft (approx)	1.5 m
Crew	12
Main engines:	2 × MTU 16V 2000 M92
Propulsion	Waterjets
Speed	40 kn @ 100% MCR
Range	Over 1000 n miles at 10 kn
Weapons	Three machine guns
	One 20 mm cannon

First Vessel Launched at Austal Tasmania

The first of two 47.5 m passenger catamaran ferries for New World First Ferry (Macau) was launched at Austal Tasmania on 28 April, marking a historic milestone for the growing shipyard.

With new orders for the shipyard being finalised and a workforce which has grown from 40 to more than 120 over the past 12 months, the first launch signals the emergence of Austal Tasmania as a significant member of Austal's global production capacity.

Located in Margate, south of Tasmanian capital Hobart, the modern shipbuilding facility was purchased by Austal in February 2007 and boasts a history of quality aluminium ship construction.

Austal Executive Manager, Stephen Lupi, said the Tasmanian shipyard was an important addition to Austal's worldwide production facilities.

"With a focus on small-to-medium size construction, our Tasmanian yard further diversifies Austal's current capabilities, allowing the fast delivery of smaller vessel orders built to the highest quality standards at a competitive cost," he said.

The two vessels for New World First Ferry are scheduled to enter service later in the year to meet the growing tourism demand generated by the dramatic increase in Macau's tourist arrivals since the development of its gaming and mega-resort industry.

With five Austal 47.5 m high-speed passenger catamarans

First 47.5 m catamaran for New World First Ferry (Macau) launched at Austal Tasmania
(Photo courtesy Austal)

already in service in the New World First Ferry fleet, the latest ferries operate at service speeds over 42 kn while carrying 418 passengers.

Both vessels will be powered by four MTU 16V 4000 M70 diesel engines, each producing 2320 kW and driving Rolls Royce/KaMeWa waterjets.

The two vessels are among 16 Austal passenger ferries currently on order for the China/Hong Kong region, seven of which have already been delivered. Upon completion of its latest order, Austal will have delivered 52 vessels to the region.

The second vessel is scheduled for launch at the end of May 2008.

Principal Particulars

Length OA	47.5 m
Length WL	43.9 m
Beam (moulded)	11.8 m
Hull depth (moulded)	3.8 m
Maximum draft	1.6 m
Deadweight (max)	70 t
Passengers	418
Crew	8
Fuel (max)	20 000 L
Propulsion	
Engines	4 × MTU 16V 4000 M70 each 2320 kW at 2000 rpm
Gearboxes	4 × Reintjes VLJ 930
Waterjets	4 × KaMeWa 63 SII
Service Speed	42.5 kn
Survey	
Classification	DNV ✠1A1 HSLC Passenger R2 EO

More Work for Austal Tasmania

Austal confirmed an order on 12 May for Queensland Police boats. An unconditional contract has been signed with a value of approximately $A12 million with the Queensland Police Force for the construction of three 22 m catamaran police boats.

The vessels will be constructed at Austal's Tasmanian shipyard and are scheduled for delivery by mid 2009.

Incat's Japanese Delivery

The latest vessel built by Incat has been delivered to her Japanese owner. The second high-speed wave-piercing catamaran for Higashi Nihon Ferry, *Natchan World,* will join her sister, *Natchan Rera*, completed by Incat last August, in service across Japan's Tsugaru Strait between the islands of Honshu and Hokkaido.

At nearly 11 000 t gross, the new 112 m long *Natchan World* is one of the largest vessels yet built by Incat.

Before being handed over by Incat, an impressive two months ahead of schedule, *Natchan World* was officially named in a ceremony at the Incat shipyard on Tuesday 8 April.

"This name was chosen because passengers and local residents have already become very familiar with the "Natchan" name carried by the first Incat 112 m ferry, and we wanted to keep the friendliness that "Natchan" has acquired," said Higashi Nihon Ferry President, Mr Shinji Koga.

In Japan, the girl's name Natsumi is often shortened to Natchan and in Hobart once again to perform the naming ceremony was Natsumi Kawashima, a seven year-old Japanese girl whose grandfather, Mr Mutsuo Kawashima, is a well-known artist of Japanese traditional style painting. Assisted by her father, Mr Wataru Kawashima, himself a Japanese-style painter who is a lecturer at Kyoto City University of Arts, Natsumi proudly named the ship before a crowd of around 1500 spectators including a contingent of fifty Japanese guests who flew in from Japan for the ceremony.

Like *Natchan Rera* before her, *Natchan World*'s eye-catching livery is adapted from paintings made by a Japanese child. The colourful design was publicly sought in Japan, with over 500 children under 12 years old responding to the call for the ferry's colourful "Parade" theme. Mr Toshikazu Yamaoka, an artist living in Kyoto, chose "lovely creatures" and integrated them into the livery.

Mr Koga explains "Throughout the hull, we can feel an unconstrained concept anchored in a child's unique perspective. Original designs were copied as much as possible to make the most of childlikeness seen in the touch of lines drawn. We can see various companies in the sea beyond the ages and species parading together on a rhythmical music note".

With *Natchan World,* Incat has reached a pinnacle in high-speed craft luxury and comfort with this its most valuable export to date. Operating at speeds of approximately 40 kn and with capacity for up to 800 persons and 355 cars, or 450 lane metres of trucks and 193 cars, *Natchan World* is almost identical to her sister, *Natchan Rera*.

Some changes have been implemented, including a new form of relaxation for Executive Class passengers which cannot be experienced in any flights, trains or cruise ships. Here, instead of individual seats, there are small booth-style compartments for two to four passengers. In each compartment, passengers are free to take off their shoes and lie down. Massage chairs will be installed in the same cabin as well. Families and couples will enjoy not only their time in private with amazing comfort, but also the vast scale of ocean view in front of each booth.

Principal Particulars

Length OA	112.60 m
Beam (mld)	30.50 m
Draft	3.93 m (approx)
Speed	40 kn
Deadweight	1450 t max.
Total persons	800
Vehicle Deck	450 truck-lane metres plus 193 cars or 355 cars.
Fuel consumption	6.84 t (8208 L) per hour at 40 kn

Commission of Inquiry into Loss of Cruiser HMAS *Sydney*

On 31 March the Acting Prime Minister, the Hon. Julia Gillard, and the Chief of the Defence Force, Air Chief Marshal Angus Houston, announced the establishment of a Commission of Inquiry into the loss of HMAS *Sydney* II.

The Hon. Terence Cole AO RFD QC has been appointed President of this Commission of Inquiry.

With the aid of additional information likely to become available as a result of the discovery of the wreck of the cruiser HMAS *Sydney*, the Commission of Inquiry will seek to determine the circumstances surrounding the tragic loss of the ship with its entire crew in November 1941, following an engagement with the German raider HSK *Kormoran*.

The wrecks of the ships were recently discovered off the Western Australian coast by the Finding Sydney Foundation. *Kormoran* was located on 12 March lying in 2560 m of water approximately 112 n miles off Steep Point, Western Australia. HMAS *Sydney* was found on 16 March about 12 n miles SE of *Kormoran* in 2479 m of water. Using a remotely-operated vehicle, the Finding Sydney Foundation extensively photographed both wrecks — images which will help the inquiry determine what happened during the engagement which resulted in the loss of *Sydney* and her crew of 645 men.

Acting Prime Minister Gillard praised the Chief of the Defence Force for establishing the Commission of Inquiry which would examine the 66 year mystery of how HMAS *Sydney* was lost with all hands.

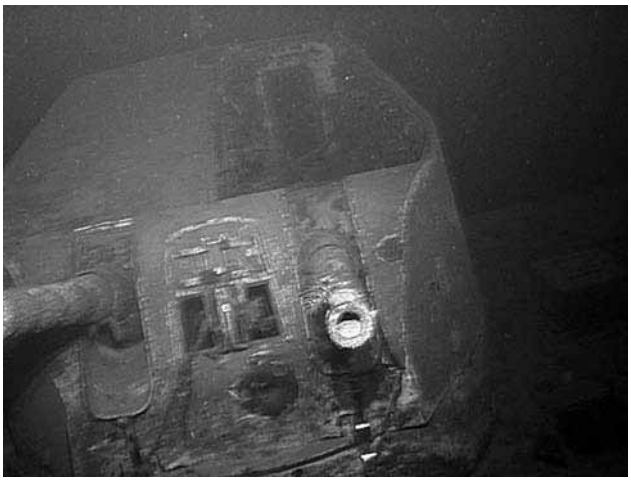
"More than 600 of our nation's finest sailors and airmen lost their lives, and we still don't know exactly how *Sydney* met her end," she said.

"I hope that, through this inquiry, we have a better understanding of what happened on that fateful day. In particular, I know that this inquiry will have special significance to the families of those who lost loved ones in HMAS *Sydney*."

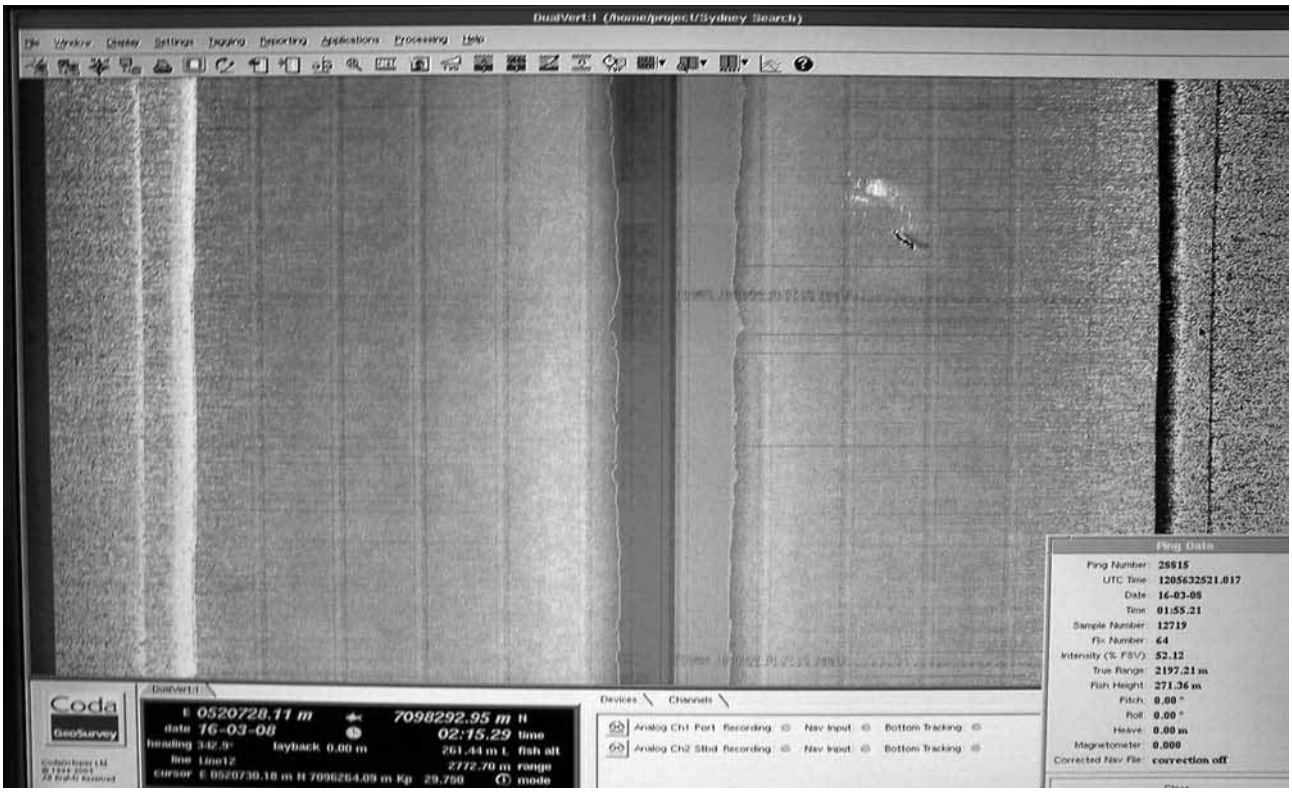
Air Chief Marshal Angus Houston said Mr Cole was eminently qualified to preside over one of Australia's greatest maritime mysteries.

"I am extremely pleased that Mr Cole has accepted this appointment. He has a wealth of judicial experience and is very capable of undertaking this important task," he said.

"During his distinguished career, he has presided over two Royal Commissions, served as a NSW Supreme Court Judge, Judge of the NSW Court of Appeal, and has held the position of Deputy Judge Advocate General of the Australian Defence Force."



HMAS *Sydney's* B Turret — one of the remarkable images of the ship on the bottom off Western Australia
(Photo Finding Sydney Foundation)



The wreck of *Sydney* as revealed for the first time in this sonar image. The wreck is clearly visible on the port (right) channel adjacent to a well-defined debris field. The height of the wreck above the seabed is causing the dark acoustic shadow just to the right of the wreck
(Photo Finding Sydney Foundation/Department of Defence)

OPLs from Kamira

NGV Tech in Malaysia has extended their build schedule from three 22 m OPL (outside port limits) supply vessels designed by Kamira Holdings to a total of four.

Principal particulars of the new vessels are:

Length OA	22.0 m
Length WL	20.7 m
Beam	5.5 m
Draught hull	1.00 m
overall	1.50 m
Displacement	24.8 t light
	42.8 t loaded
Engines	2 × Caterpillar 3406C
	each 358 kW at 2100 rpm
Gearboxes	2 × ZF 360,
	reduction ratio 2.478:1
Gensets	2 × 27 kW Kohler
Fuel	6000 L
Water	1000 L
Crew	4
Passengers	12
Cargo	10 t nominal
	20 t maximum
Speed	15 kn at full load
Construction	Aluminium
Class	BV

These vessels were described in more detail in the February 2008 issue of *The ANA.*

Greg Cox

Seacor Cheetah from Incat Crowther

Incat Crowther have made a breakthough into the fast crew/supply vessel market with the world's first and fastest ABS Class DP-2 fast crew/supply catamaran. This market has predominantly excluded the fast-ferry technology on the grounds of excessive cost. However, one of the Gulf region's largest crew-boat operators, Seacor Marine, has seen the potential of both the designer, Incat Crowther, and the builder, Gulf Craft Inc., to provide a high-speed crew-boat solution, following its inspection of the recently-completed 52 m catamaran ferry, *Key West Express*. Several aspects of this vessel impressed Seacor. The first was the manner in which the vessel handled the sea conditions in the Gulf of Mexico, and others included the carrying capacity and performance that were demonstrated by *Key West Express*. These aspects convinced Seacor that the catamaran could be utilized in the crew-boat market.

After a 14-month build period, *Seacor Cheetah* has just completed trials and has now begun operations in the Gulf of Mexico. The vessel has so far exceeded all expectations and is providing operators with a new logistics tool for moving their workforces on and off the oil and gas platforms. *Seacor Cheetah* has many safety features, including state-of-the-art electronics, communications, and navigation systems. A fully-equipped ABS-certified DP2 system allows the vessel to increase its operating weather window, enabling her to hold station in adverse weather conditions where other vessels simply could not work. The vessel has also been fitted with the latest personnel-transfer system which has been specifically designed to protect passengers from the dangers of ship-to-platform transfers.

Seacor Cheetah will also provide a new level of creature comfort in the main passenger cabin. Designed to seat 150 passengers in wide upper-class reclining seats, the vessel also features modern wireless internet and satellite radio communications, widescreen LCD digital entertainment, and self-serve snack-bar facilities. The vessel's hull also incorporates design features which provide a smoother more-comfortable ride in rough sea conditions. The wide, high-sided hull softens wave impact at high speed, and the use of the MDI Interceptor-based ride-control system reduces the effects of roll and increases the average person's tolerance to seasickness by approximately an hour.

In addition to carrying its payload of passengers, *Seacor Cheetah* can carry deck cargo and liquid supplies to the platforms. The large aft deck measures 27 m × 9 m, giving an impressive 250 m^2 loading area with a carrying capacity of 150 t. Both hulls have cargo tank capacity for 45 800 L of fuel and about 11 400 L of water. In total, *Cheetah* has a deadweight capacity of 177 t.

The vessel has been powered by four MTU16V4000 M71 main engines, each producing 2465 kW brake power and driving Hamilton HM811 waterjets through Twin Disc reverse/reduction gearboxes. The vessel can maintain very impressive speeds across all available payload scenarios. At the full passenger-only condition (51 t) the vessel has achieved 42 kn and, in the maximum load condition (177 t), she achieved 37 kn. These speeds are far in excess of what the existing fleet of vessels can achieve, and now provide operators with far more options in general crewing and storm evacuation.

Gulf Craft Inc. is a Louisiana-based shipyard which has been building aluminum vessels since 1965. They have now built four large Incat Crowther high-speed catamarans. A second "Crewzer" class crew boat is currently under construction.

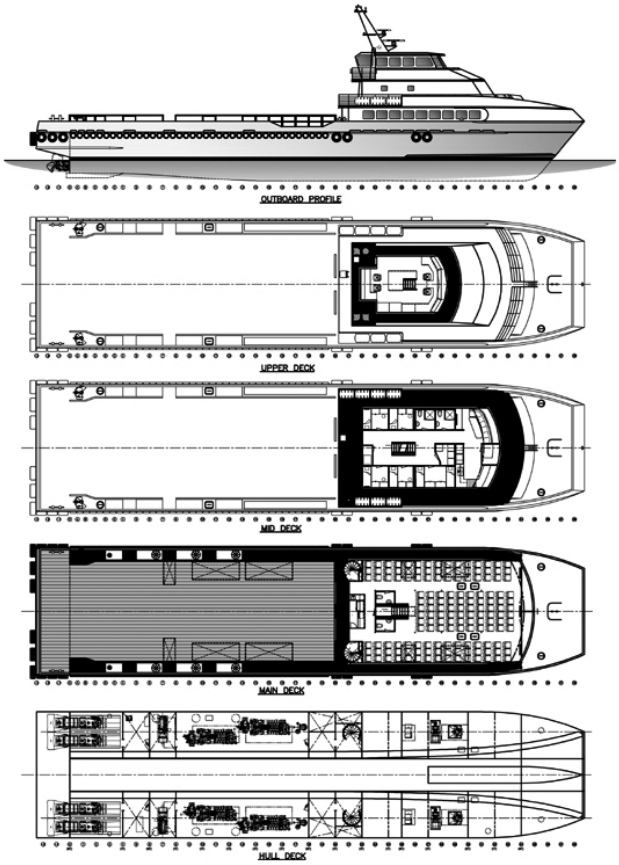
Seacor Marine operates one of the world's largest fleets of offshore marine support vessels, serving the global offshore oil and gas exploration and production industry.

Principal particulars of *Seacor Cheetah* are as follows:

Length OA	167.25 ft	50.98 m
Length WL	145.8 ft	44.44 m
Beam OA	38.5 ft	11.73 m
Draft (approx)	7.0 ft	2.13 m
Passengers		
Main Deck internal	150	
Crew	10	
Cargo space	90 ft × 30 ft (27 m × 9 m)	
Cargo area	2700 ft^2 (250 m^2)	
Cargo deck (max)	150 t	
Cargo fuel	12 200 gal (45 800 L)	
Ship's fuel	13 700 gal (11 400 L)	
Ship's fresh water	3600 gal (1360 L)	
Max. deadweight	177 t	
Engines	4 × MTU 16V 4000 M71	
	each 2645 kW @ 2000 rpm	
Gearboxes	4 × Twin Disc/Nico	
	MG61242SC	
Waterjets	4 × Hamilton HM811	
Speed	42 kn @ 51 t deadweight	

Gensets	2 × Cummins QSM11 each 290 kWe
Construction	Marine-grade aluminium
Survey	USCG Sub Chapter T/L

Ben Hercus



General Arrangement of *Seacor Cheetah*
(Drawing courtesy Incat Crowther)

Progress on *John Oxley*

The re-plating of the sides of *John Oxley* is proceeding apace. Each side of the ship requires 60 plates, with the majority being replaced. The sheer strake will be done after the vessel is refloated. The port and starboard shell expansions are shown on the website, with progress recorded in colour. As of 12 April, the following plates had been completed:

	Starboard	Port
Made	50 (83%)	51 (85%)
Fitted	43 (72%)	42 (70%)
Riveted	39 (65%)	39 (65%)

Visit www.shf.org.au/jo-restoration for the full story.

Sea Cheetah on trials
(Photo courtesy Incat Crowther)

Cruising

There was much excitement with the last visit of the grand lady *Queen Elizabeth 2* and the first visit of the brand-new *Queen Victoria* crossing paths on the harbour on Sunday 24 February. After that, the summer cruise season wound down through March and April, with visits by *Sun Princess, Sapphire Princess, Pacific Dawn, Pacific Sun* and *Topaz.*

Sun Princess and *Pacific Dawn* are the only vessels scheduled for cruises during May–October, when the cruise vessels for the next summer season start arriving, with *Rhapsody of the Seas* due in mid-October.

Phil Helmore

Sea Cheetah showing her paces
(Photo courtesy Incat Crowther)

Queen Victoria at the Overseas Passenger Terminal in Circular Quay
(Photo John Jeremy)

Queen Elizabeth 2, inbound from Fleet Base East to the OPT in Circular Quay,
passing *Queen Victoria* outbound on 24 February
(Photo John Jeremy)

Two-phase Marine Ramjet Propulsion Research

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ABSTRACT

Research conducted at the Technion – Israel Institute of Technology on two-phase marine ramjet propulsion is summarised. This is a non-conventional concept, characterised by thrust generation with no moving mechanical parts in contact with the water. Water enters the submerged propulsion unit due to the vessel motion. Thrust is generated by adding compressed air bubbles into the water, accelerating the exhaust jet as a result of their expansion in the water. Theoretical analysis and experimental work consisting of water tank tests and sea trials reveal good performance and avoidance of cavitation problems. The two-phase ramjet propulsion is particularly suitable for high-speed cruising.

NOMENCLATURE

C_p	Specific heat (J/kg K)
F	Thrust (N)
K_r	Kinetic energy (or pressure) recovery
$\dot{m}$	Mass flow rate (kg/s)
P	Pressure (N/m^2 or atm)
R	Specific gas constant (J/kg K)
r	Pressure ratio, P_{comp}/P_a
S	Entropy (J/K)
T	Temperature
U	Speed (m/s or knots)
V	Volume (m^3/kg)
W	Work (J)
w	Work per unit mass (J/kg)
X	Velocity ratio, U_e / U_∞
γ	Specific heat ratio
η_{cycle}	Cycle efficiency
η_p	Propulsion efficiency
η_{trans}	Power transmission efficiency (= Cycle efficiency)

Subscripts

a	Ambient; Air
comp	Compressor
e	Exit; Exhaust
exp	Gas expansion
mix	Mixing chamber
t	Total
w	Water
∞	Free stream

INTRODUCTION

This article summarises research conducted at the Technion – Israel Institute of Technology to characterise and develop the two-phase marine ramjet propulsion concept. The operating principle of the marine ramjet is similar to that of the aeronautical ramjet; namely, accelerating the incoming working fluid (water in the marine ramjet, air in the aeronautical ramjet) without the application of direct mechanical power. Referring to Figure 1, water at ambient conditions enters the submerged propulsion unit (which is basically a hollow duct having a designed internal contour) at a speed U_∞ equal to the vessel's cruise speed. The marine ramjet utilizes the dynamic pressure of the water resulting from the vessel motion, converting it into static pressure as a result of slowing down the incoming water within the inlet diffuser. The energy necessary for thrust generation is added in the form of compressed air bubbles introduced into the mixing chamber at the local interior pressure. While flowing along the nozzle the pressure goes down and the bubbles expand, converting their expansion work into an increase in the kinetic energy of the two-phase exhaust jet, thus generating thrust.

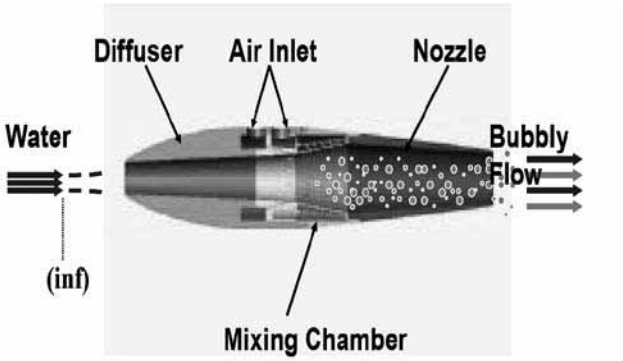

Figure 1 — Schematic illustration of the two-phase bubbly ramjet propulsion unit.

Assuming an adapted nozzle, where the exit plane pressure is equal to the ambient pressure, $P_e = P_a$, and taking into account that the gas mass flow rate is almost negligible (less than 1%) compared to the water flow rate, namely, $\dot{m}_a << \dot{m}_w$, then the thrust equation is

$$F = \dot{m}(U_e - U_\infty) \qquad (1)$$

where $\dot{m}$ is approximately equal to $\dot{m}_w$.

The two-phase marine ramjet has certain specific advantages: there are no moving parts in contact with the water, and power is transmitted pneumatically instead of mechanically, allowing flexibility in the vessel's interior space design. In addition, because of the typical internal pressure characteristics, no cavitation phenomena are encountered, allowing good performance at very-high speeds exceeding the typical range of propeller operation. One may see a more detailed description in patents by Varshay and Gany [1, 2]. Note that typically, a marine ramjet designed for high cruise speed is not intended to start from rest, and may require auxiliary propulsion for the low-speed range. Researches on bubbly flows through nozzles which are relevant to this work can be found in [3-9].

CYCLE ANALYSIS

The ideal power-cycle analysis of the two-phase ramjet is based on Gany [10]. One assumes homogeneous flow, where the two phases have the same velocity, temperature, and pressure. The thermodynamic power cycle for a unit mass

of air is shown in Figure 2. Air at ambient temperature T_a and pressure P_a (Station **a**) is compressed by a compressor to a pressure P_{comp} (station **comp**). The compressed air is channeled to the underwater thrust unit, where it is injected and mixed with the water flow in the form of dispersed bubbles within the mixing chamber. The compressed air pressure is equal to the mixing-chamber pressure (which is actually the ram pressure, resulting from slowing down the water stream within the diffuser), $P_{comp} = P_{mix}$. During the mixing process (approximately at a constant pressure), the air bubbles rapidly lose their thermal energy. The process is represented on the thermodynamic diagram by the line between Station **comp** and Station **mix**. This rapid cooling is supported by [8], indicating that almost no efficient use of gas thermal energy can be done in this process. During their motion from the mixing chamber to the nozzle exit (back to the conditions of Station **a**), the air bubbles expand isothermically because of thermal energy absorbed from the surrounding water, while their pressure is dropping from P_{mix} to the ambient pressure P_a. The expansion process of the air bubbles results in work done on the water medium, increasing its kinetic energy.

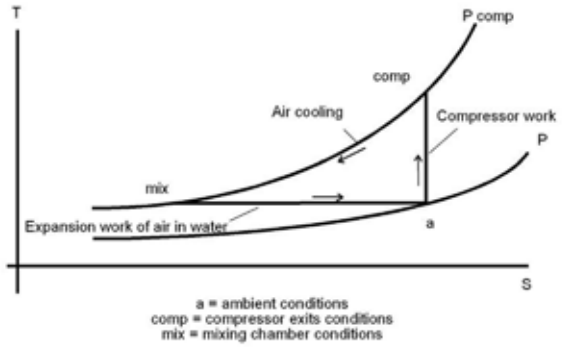

Figure 2 — Ideal thermodynamic power cycle of the two-phase ramjet (after Gany [10]).

Cycle / Power Transmission Efficiency

The work invested in ideal (isentropic) compression of a unit mass of air is:

$$w_{comp} = C_p T_a (r^{\frac{\gamma-1}{\gamma}} - 1) \qquad (2)$$

where r is the compression ratio:

$$r = P_{comp} / P_a \qquad (3)$$

Note that during the compression process the air temperature increases:

$$T_{comp} = T_a r^{\frac{\gamma-1}{\gamma}} \qquad (4)$$

For an ideal gas, the specific heat C_p is

$$C_p = \frac{\gamma R}{\gamma - 1} \qquad (5)$$

where R is the specific gas constant. Hence,

$$w_{comp} = \frac{\gamma R T_a}{\gamma - 1}\left(r^{\frac{\gamma-1}{\gamma}} - 1 \right) \qquad (6)$$

For air $\gamma = 1.4$ and $R = 287$ J/kg K.

As mentioned before, the thermal energy of the compressed air is transferred to the water without doing effective work. Due to the huge difference in the overall thermal capacity of the water compared with the air, the water temperature practically does not change. The power transmission to the water is done via the air expansion work:

$$W = \int P dV \qquad (7)$$

Work per unit mass of air during isothermal expansion from P_{comp} to P_a is:

$$w = R T_a \ln r \qquad (8)$$

The power-cycle efficiency is defined as the ratio between the isothermal-expansion work transmitted to the water and the compressor-delivered work (which is equal to the isentropic-compression work in the ideal cycle):

$$\eta_{cycle} = \frac{w_{exp}}{w_{comp}} = \frac{\ln r}{\frac{\gamma}{\gamma - 1}\left(r^{\frac{\gamma-1}{\gamma}} - 1 \right)} \qquad (9)$$

For any compression ratio greater than unity, the isothermal expansion work is smaller than the isentropic compression work. We consider the cycle efficiency as the power-transmission efficiency (from the gas to the water):

$$\eta_{trans} = \eta_{cycle} \qquad (10)$$

Pressure increase in ramjet propulsion is a result of dynamic pressure (ram pressure) conversion into static pressure. Maximum attainable pressure is the stagnation pressure (total pressure P_t), obtained where the fluid slows down to zero velocity. Stagnation pressure vs cruise speed in water is shown in Fig. 3. The pressure ratio P_t / P_a is the maximum compression ratio (P_{comp} / P_a) for any cruise speed:

$$P_{comp,\max} = P_a + \frac{1}{2}\rho_W U_\infty^2 = P_t \qquad (11)$$

In the cycle-efficiency calculations it was assumed that the water flow velocity in the mixing chamber, where the air is injected, is equal to 50% of the free stream velocity U_∞

Hence, the resulting pressure in the mixing chamber P_{mix} is lower than the total pressure P_t. As assumed for the ideal

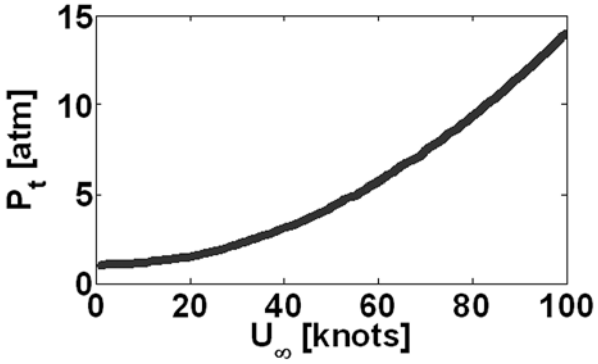

Figure 3 — Stagnation pressure vs. cruise speed in water.

cycle, $P_{comp} = P_{mix}$. Hence,

$$P_{comp} = P_a + \frac{3}{4}\left(\frac{1}{2}\rho_W U_\infty^2\right) = P_t - \frac{1}{8}\rho_W U_\infty^2 \qquad (12)$$

Cycle efficiency or power transmission efficiency η_{trans} vs cruise speed is presented in Fig. 4 according to Eq. (9), using P_{comp} from Eq. (12). One can see that, in the ideal case, η_{trans} decreases gradually from a value of unity at zero speed through about 90% at 30 knots to about 83% at 50 knots.

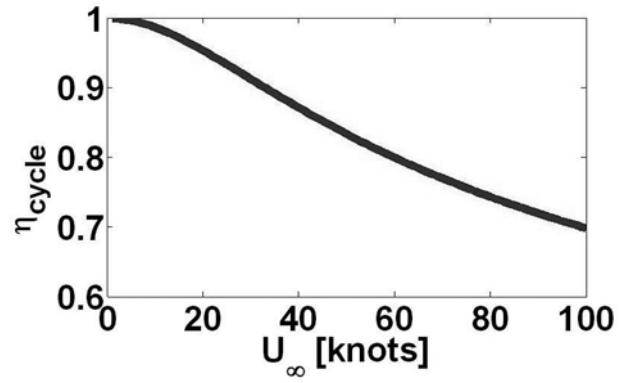

Figure 4 — Cycle efficiency (= power transmission efficiency) vs. cruise speed for the ideal cycle [after Gany [10]).

Propulsion Efficiency

The propulsion efficiency η_p is defined as the ratio between the thrust power and the compressor-delivered power. The thrust power is:

$$FU_\infty = \dot{m}(U_e - U_\infty)U_\infty \qquad (13)$$

Energy balance (per unit mass of water) in the jet propulsion unit:

$$\frac{U_e^2}{2} = K_r \frac{U_\infty^2}{2} + \eta_{trans} W_{comp} \qquad (14)$$

where K_r is kinetic energy recovery of the incoming water flow. Since water is an incompressible fluid, K_r also represents the dynamic inlet pressure recovery within the propulsion unit.

The propulsion efficiency can be expressed as follows:

$$\eta_p = \frac{(U_e - U_\infty)U_\infty}{\frac{1}{\eta_{trans}}\left[\frac{U_e^2}{2} - K_r\frac{U_\infty^2}{2}\right]} \qquad (15)$$

In terms of velocity ratio, $X = U_e / U_\infty$:

$$\eta_p = \frac{2\eta_{trans}(X-1)}{X^2 - K_r} \qquad (16)$$

One can show that the optimal jet to cruise velocity ratio (for highest propulsion efficiency) is:

$$(U_e / U_\infty)_{opt} = 1 + \sqrt{1 - K_r} \qquad (17)$$

TEST FACILITIES

Two dynamic test facilities dedicated to the two-phase marine ramjet research have been constructed and applied at the Technion. The first one is a water tank facility using a laboratory, small scale, ramjet propulsion unit. It was initially constructed to serve the MSc project of Varhsay [11]. Then it was upgraded and used for the generation of experimental data during the MSc research of Koren [12]. The facility consists of a 10 m diameter water tank having an arm rotating about a central axle (Fig. 5). The propulsion unit is mounted at the end of the arm, and can move in circles in the water. Compressed air is supplied through the central axle to the propulsion unit, enabling its thrust generation. An electronic pod acquires and further transmits to a computer the data provided by pressure gauges along the propulsion unit as well as by a choked-orifice flow meter. Motion velocity is detected continuously by a frequency meter at the axle. A torque meter provides thrust and drag data. The ramjet propulsion unit in the water tank tests is 30 cm long, with a 2.5 cm inlet diameter.

Figure 5 — Water tank facility at the Technion – Israel Institute of Technology.

The second test rig is an instrumented 4 m boat, serving as a sea-trial platform. Two propulsion units, about 1 m long and 10 cm average inlet diameter, are mounted at the bottom of the boat. Compressed air at a maximum overall flow rate of 500 g/s is supplied by a turbo-compressor (Model WR-27-1 APU) installed on the boat. Airflow and pressure at different stations along the air pipe and propulsion unit

are measured by a flow meter (Series 454FT, Kurtz Instruments Inc.) and pressure gauges. The instrumented boat is shown in Figure 6. The boat during sea trials within the framework of the MSc research of Valensi [13] is presented in Figure 7.

Figure 6 — The instrumented 4-m boat used as a test platform for full-scale sea trials. The two ramjet propulsion units are mounted at the bottom rear part of the boat.

Figure 7 — The experimental boat during sea trials (after Valensi [13]).

RESULTS AND DISCUSSION

A number of test series took place in the water tank over a speed range of 7 to 14 m/s (14 to 28 kn, respectively). A typical test series consisted of a number of tests conducted at the same velocity while varying the airflow rate. Figure 8 (after Koren [12]) presents the test results obtained at propulsion unit velocities of 7, 9 and 11 m/s (14, 18 and 22 knots, respectively) with airflow rates between 10 and 40 g/s. The predicted theoretical results are shown on the same plot. One can see a good agreement with some 10-20% thrust losses. The losses may be attributed mainly to excessive airflow rate applied in the tests.

Towing tests in the open sea using the experimental boat provided thrust data for the speed range of 2.5 to 11 m/s (5 to 22 knots, respectively). Because of the waves and uncontrolled environment, there has been noticeable experimental noise, and each data point is a result of the average of a number of tests at the same conditions. Test results compared to theoretical prediction are presented in Figure 9 (after Valensi [13]), showing good agreement with a typical experimental spread.

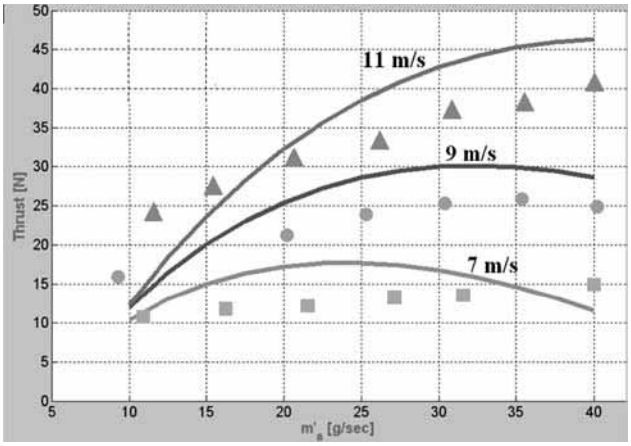

Figure 8 — Comparison between thrust data of water tank experiments and theoretical predictions (after Koren [12]).

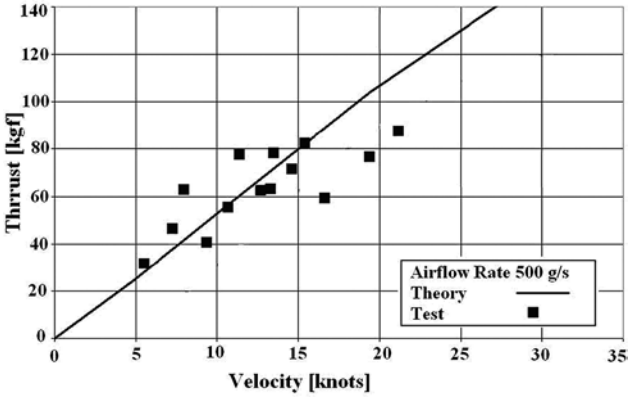

Figure 9 — Comparison between thrust data obtained from a 4 m boat in sea trials and theoretical prediction (after Valensi [13]).

SUMMARY

Two-phase marine ramjet propulsion concept has been analysed and tested at the Technion – Israel Institute of Technology. The marine ramjet exhibits some unique features: It has no cavitation problems and has no moving parts in contact with the water. The jet acceleration results from the expansion of compressed air bubbles injected into the water within the submerged propulsion unit. These particular characteristics make the two-phase marine ramjet particularly suitable for high-speed cruise operations.

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THE INTERNET

Visual Impact Gallery

The publishers of Visual Impact Gallery have recently launched a new picture and video weblog which is a gallery of images relating to the risks inherent in transport and shipping. There are pictures, videos and images relating to casualties, near casualties and anything else related to the industry. You might find it of interest to check out this website from time to time, as many of the photos illustrate interesting marine incidents. Visit http://visual-impact-gallery.blogspot.com.

Graham Taylor

Online Language Translator

Have you ever looked up a website only to find, to your chagrin, that it is a language with which you are not conversant? Babel Fish has the answer at http://babelfish.yahoo.com.

If you just wish to translate a piece of text, you can cut and paste the text into a dialogue box, select the From/To languages, click Translate and the translation comes up.

Alternatively, to translate a whole web page, cut and paste the URL, select the From/to languages, click Translate, and the whole page comes up translated, with images and the like unchanged and in their correct locations in relation to the text.

The translations are not always grammatically perfect, but give you the general idea — always better than nothing!

Phil Helmore

EDUCATION NEWS

Australian Maritime College

AMC Graduation – Class of 2007

Thursday 14 February 2008 saw the last of the Australian Maritime College graduation ceremonies before its integration with the University of Tasmania. Amongst the attending students were six of the nineteen students in the naval architecture class who returned to collect their piece of paper and, in some cases, medals and plaques for which they had worked so hard.

The event was held in Launceston's recently renovated Princess Theatre, where the addition of air-conditioning was very welcome for the graduates, as wearing the heavy black robes proved a difficult task in the unexpected heat.

The night began with a dress rehearsal, with both the audience and students made privy to how proceedings would take place. Then came the formal program — the Academic Procession, Acknowledgment of Country and a strong rendition of our National Anthem. After Dr David Sterrett, Chair of the AMC Board, addressed the assembly, the students were formally presented with their degrees and so began what seemed like the competition for the most excited facial expression.

Staff awards were then presented before the guest of the evening, Rear Admiral Boyd Robinson, gave an address which was both encouraging and inspiring to the students as they stepped into their new roles.

The Rear Admiral offered four points of guidance: commitment, courage, curiosity and consequences, and that to succeed each graduate needed to embrace, understand and apply themselves in each of these areas. He also reaffirmed their choice in careers, saying "The seas and oceans will be your workshops and laboratories, and your source of inspiration and energy. For many the sea will be your neighbourhood, your backyard and your front yard with its changing vistas and never-ceasing wonder".

Prizes were then awarded to students both past and present with Katrina de Graaf taking out the Connell Medal as the Best Graduate college-wide and the RINA Prize for the best research project by a naval architecture student.

The proceedings were followed by a formal procession through the streets of Launceston to the Hotel Grand Chancellor, where dinner (and, for some, dancing) provided the perfect opportunity to catch up before heading back to their new lives outside university. A special mention goes to Tom Watson who, after missing his plane flight (and, as a result, the graduation ceremony) made it in time for dinner.

Amy de Graaf

[*Katrina de Graaf's sister attended the ceremony and kindly offered to provide this summary of events. Amy is presently studying journalism at the Queensland University of Technology* — Ed.]

Awards — Department of Maritime Engineering

Bachelor of Engineering (Naval Architecture)

Trent William Adams
Matthew John Artis
Trevor William Dove
Drew Riggins Landes
Sean Alan Mason
Johanna Maria Morgan
Thomas Drew Mynard
Stewart Wells
Andrew Jay Williams

Bachelor of Engineering (Naval Architecture) Honours Class 2 Division 2

Nathan Mark Atkinson
Andrew Gareth Davies
Thomas Andrew Magnuson
Thomas Scott Watson

Bachelor of Engineering (Naval Architecture) Honours Class 2 Division 1

Glenn Avard

Bachelor of Engineering (Naval Architecture) Honours Class 1

Katrina Leigh de Graaf
Jordan Michael Glanville

Bachelor of Engineering (Ocean Engineering)

Jackson Dryne
Elizabeth Harrison
Alina Herrmann
Mathew McEwan
Matthew Pride

Bachelor of Engineering (Ocean Engineering) Honours Class 2 Division 2

Alfan Abdul Rahman

Bachelor of Engineering (Ocean Engineering) Honours Class 2 Division 1

Leon Brady

Bachelor of Engineering (Ocean Engineering) Honours Class 1

Toby Roe

Bachelor of Engineering (Marine and Offshore Systems)

Alfan Abdul Rahman
Aaron Daldy
Leonard John McKenna
Stephen Stothart

Bachelor of Engineering (Marine and Offshore Systems) Honours Class 2 Division 2

Scott Jones

Prizes — AMC Wide

The Connell Medal (*Best AMC Graduate in 2007 AMC wide)*

Katrina Leigh de Graaf

Prizes — Department of Maritime Engineering

Captain Thomas Swanson Prize (Best student over the duration of any engineering course in 2007)

Katrina Leigh de Graaf, BE (Naval Architecture)

Royal Institution of Naval Architects Prize (Best research project by a final year student in the BE (NA) program)

Katrina Leigh de Graaf

Institution of Engineers Australia Award — Norman Selfe Prize (Best achievement and attainment of professional skills in the final year of a BE degree course)

Jordan Michael Glanville

RINA-Austal Ships Prize (*Best team project in Ocean Vehicle Design in the BE (NA) program)*

Andrew Gareth Davies
Jordan Michael Glanville
Thomas Drew Mynard
Thomas Scott Watson

Baird Publications Prize (Best achievement in design-related subjects in Year 2)

Rowan Thomas Frost

Teekay Shipping Project and Technology Management Prize (Highest marks in technology and project-management-related subjects in any program)

Rowan Thomas Frost

Technip Oceania Prize (Year 4 BE (OE) student with the highest marks in Subsea and Deepwater Engineering)

Toby Frederick Roe

J Ray McDermott Asia Pacific Prize (Best achievement by a graduating student in the unit Offshore Operations in the BE (OE) or BE (MOS) degrees)

Toby Frederick Roe

Technip Oceania Prize (Year 3 BE (OE) student with the highest aggregate mark in Project Engineering and Hydrodynamics of Offshore Structures)

Landon James Kibby

Sea Struct Ocean Engineering Prize (Third year engineering student for excellence in the unit Geotechnology and Concrete Structures)

Alan Noel Fleming

Det Norske Veritas Naval Architecture Prize (Third Year Engineering student for excellence in studies, especially in Applied Ship Design)

Alexandra Sasha Ford
Adam Craig Lewis

Det Norske Veritas Marine and Offshore Systems Prize (Third Year Engineering student for excellence in studies, especially in the unit Power Plant Operations and Maintenance)

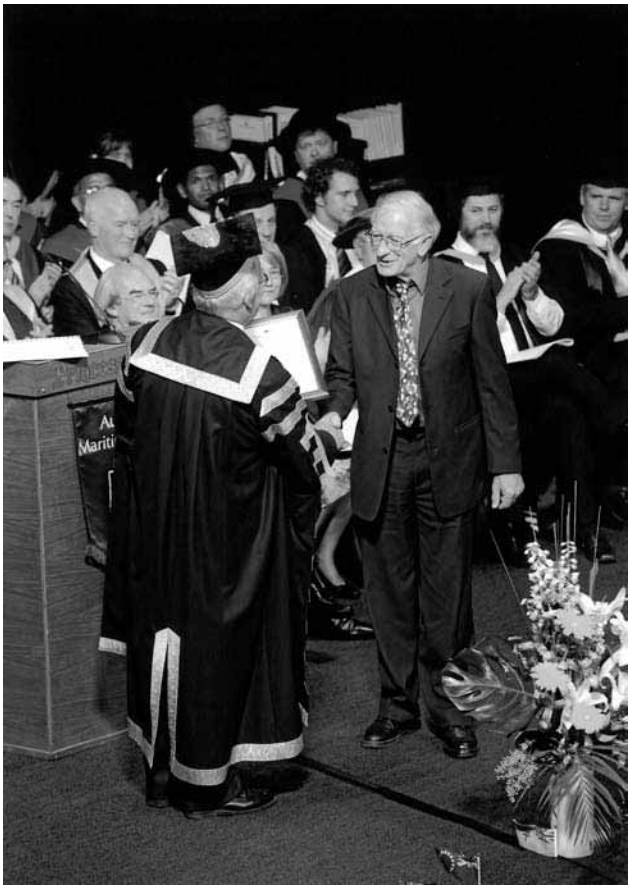
Ahmed Iruhas

AMC Council Award for Contribution to AMC

This award was presented to Stuart Phillips. The success of AMC's hydrodynamic facilities relies strongly on the production of accurate scale models. The AMC Board recognises the exceptional service given to AMC by Mr Stuart Phillips, as the primary model maker for the

hydrodynamic facilities for the past 20 years. Over this period, Stuart has constructed models of a variety of ships, maritime structures and appendages to a very high standard, mainly for use in our Towing Tank and Model Test Basin, but also for the Cavitation Tunnel and Circulating Water Channel. These facilities could never have reached their potential and achieved their good reputation without the continued access to high-quality models which not only perform the specialised function intended of them, but also appear highly professional. Using his exceptional skills in model making, Stuart has undertaken the most-challenging and complex projects, and takes considerable pride in his contribution to AMC.

The Australian Maritime College Council and staff congratulate Stuart on the excellence of his work and his commitment to the advancement of AMC.



Stuart Phillips receiving his prize
(Photo courtesy AMC)

Ocean Vehicle Design Projects

In their final year of study, Bachelor of Engineering Naval Architecture students undertake a design project in the unit Ocean Vehicle Design (OVD), working in teams to a specification supplied by an industry 'client'. The designs and their industry 'clients' this year are:

- Ro-ro vessel — Austal Ships
- Landing craft — Tenix
- Ship Docking Module — MMD
- 35 m catamaran dining vessel — Incat-Crowther
- Scientific Support and Patrol Vessel — BMT Defence Services (Australia)

The support of these industry clients is greatly appreciated, as is the input of a number of guest lecturers for the unit including Gordon MacDonald, Rob Gehling, Ken McAlpine and Sam Abbott.

Incat Research Project.

The collaborative project between UTAS, AMC, Incat Tasmania and Revolution Design continues with a range of activities. Model testing of a hydroelastic catamaran model has been conducted in the AMC towing tank in a range of conditions to measure global wave loads, including slam loads. In addition, tests have been carried out in the AMC's model test basin to determine the wave loads in oblique seas, for example split and pitch-connection moments. A recent development has been the preliminary instrumentation of the centre bow of a catamaran model with an array of pressure transducers to determine the magnitude and distribution of wet-deck pressures during slam events. Full-scale motions and load measurements have also been conducted on the first two 112 m vessels during delivery trips to Japan. The project team consists of Prof. Mike Davis, Dr Giles Thomas, Dr Damien Holloway and PhD students Shinsuke Matsubara, Jason Lavroff and Walid Amin. This project is funded by the Australian Research Council.

First Year Engineering Student Activities

AMC's first-year undergraduate engineering students recently undertook a range of practical engineering activities using the AMC's vessels *Stephen Brown*, *Revi*resco and *Bluefin*.

AMC's National Centre for Maritime Engineering and Hydrodynamics staff developed a range of activities to give first year students hands-on experience which will enhance their understanding of what engineers do and the theory and principles taught in first semester units, Statics, Engineering Mathematics I, Design and Computer Aided Drafting, and Programming and Problem Solving for Engineers. The practical exercises included the following:

Inclining experiment on Reviresco

Students investigated conditions of equilibrium for the vessel through the movement of onboard masses, angles of heel and the forces and moments which may apply to a floating object. Discussion and investigation of centre of gravity and of free body diagrams applying to various structures at the marine facilities were also offered. Direct links between generic statics and hydrostatics were demonstrated. Students also investigated the shore-based structures surrounding the AMC Beauty Point wharf.

Speed Trial on Bluefin

Students were required to conduct a set of speed trials to determine the maximum speed which *Bluefin* can attain over a measured distance. Developing a plan was key to the success of this activity. In planning, students needed to consider what equipment was available on the bridge for recording position and speed, what ship details needed to be noted, and what environmental variables needed to be measured. This activity was a logical follow-on from a series of calm-water resistance experiments the students conducted on a 1:20 scale model of *Bluefin* in the AMC towing tank the previous week.

Design Aspects on Stephen Brown

Students were required to gather information onsite to perform design work as if they were field engineers. They

gathered information and presented diagrams on the various components that make up the ship's structure in way of the hull cross section, and an overview of the powering and propulsion systems.

Marine Engines in Stephen Brown

The pathway of the fuel-oil system for the main engine was identified, and flow diagrams to indicate where the fuel flows from and what devices it encounters along the way to the combustion chamber were sketched. Students also had the opportunity to measure the shaft deflections of the engine crank.

The activities were also extremely valuable as they gave students an understanding of non-technical aspects of the engineering industry, such as occupational health and safety, fire awareness, and survival training. Students were expected to complete their AMC Elements of Shipboard Safety Training as part of the safety requirement for conducting activities on board AMC vessels.

These activities would not have been possible without the cooperation and involvement of AMC staff at Beauty Point.

Irene Penesis

Students looking at various engine components on board *Stephen Brown*
(Photo courtesy AMC)

Students performing an inclining experiment on board *Reviresco*
(Photo courtesy AMC)

BioPower Systems

BioPower Systems Pty Ltd is an Australian company based in Sydney which is commercialising award-winning biomimetic ocean-energy-conversion technologies. They have adopted nature's mechanisms for survival and energy conversion in the marine environment, and have applied these in the development of their proprietary wave and tidal energy systems.

Students investigating the forces and moments which may apply to a floating object
(Photo courtesy AMC)

Students returning from a voyage from performing speed trials on *Bluefin*
(Photo courtesy AMC)

The inherently-simple bioWAVE™ and bioSTREAM™ devices are designed to supply utility-scale grid-connected renewable energy using lightweight modular systems. These systems will reside beneath the ocean surface, out of view, and in harmony with the living creatures which inspired their design.

BioPower's Chief Executive Officer, Dr Tim Finnigan said "Some of the traits which we observe in large sea plants and fish provide us with clues on how to design machines which will function well in the ocean environment, convert energy efficiently, and survive in the worst storms. The design concepts have been verified through tank testing at the AMC."

BioPower Systems has recently undertaken a third session of physical scale model experiments on both the bioWAVE™ and bioSTREAM™ devices within AMC's Towing Tank. The wave energy-conversion system, bioWAVE™, is based on the swaying motion of sea plants in the presence of ocean waves. The tidal energy-conversion system, bioSTREAM™, is based on the highly efficient propulsion of thunniform-mode swimming species, such as shark, tuna, and mackerel. Systems are being developed for 250 kW, 500 kW and 1000 kW capacities to match conditions in various locations.

A BioPower Systems Pty Ltd prototype of the bioWAVE™

design will be installed off King Island and the bioSTREAM™ off Flinders Island in late-2009. The ocean-energy converters will generate up to 250 kW each, supplying the electrical needs of the islands, both of which now rely on diesel fuelled and wind power.

BioPower's Dr Finnigan said "This project will allow us to develop the technologies to be ready for commercial production within a couple of years. We aim to have both systems connected to the distribution grids, with discussions already held with Hydro Tasmania."

A scale model of bioWAVE™ during recent testing in the AMC towing tank
The diver is obtaining underwater footage
(Photo courtesy AMC)

AMC Bachelor of Engineering Careers Day

The second AMC Maritime Engineering Industry Day and Careers Fair, held on 9 May, was a resounding success. Representatives from 25 companies and organisations visited the AMC to present the opportunities they can provide to engineering students. This was of great value not only for fourth year students looking for a job when they graduate, but also for students investigating work experience possibilities.

Proceedings began on Thursday night with an informal gathering at a local hotel for students, staff and industry representatives. On Friday the industry representatives set up trade stands in an Expo Show and also gave short presentations to an audience of students. With the ship design and building and offshore oil and gas industries experiencing a boom period in Australia, graduates have many opportunities available to them.

The efforts of industry in attending the Industry Day and Careers Fair were greatly appreciated. Anyone who is interested in attending in the future, please contact Giles Thomas (gthomas@amc.edu.au) to ensure that they are on the mailing list. Companies and organisations who were in attendance this year included:

Commercial Marine Solutions
Lloyd's Register Asia
INTEC Engineering
Dredging, Environmental and Marine Engineering)
ASC Pty Ltd
Clough
Neptune Marine Services
ASC Shipbuilding Pty Ltd
Austal Ships
Marine and Safety Authority Tasmania
Australian Maritime Safety Authority
Navy Systems Command, Department of Defence
DET Norske Veritas
Veem Engineering
BMT Defence Services (Australia) Pty Ltd
DOF Subsea
DSTO
AMOG Consulting
Australian Marine Technologies
Soros Associates
Technip Oceania
Defence Material Organisation
Navy Headquarters Tasmania
Tenix Marine
Formation Design Systems

Giles Thomas

AMC Research Report 2007

AMC has recently compiled a report outlining recent research activities. This document represents the culmination of AMC's research effort for 2007 and presents a significant contribution to the field of maritime research. The year was one of exciting change at the AMC, including a significant restructure into three national centres: the National Centre for Maritime Engineering and Hydrodynamics (NCMEH); the National Centre for Marine Conservation and Resource Sustainability (NCMCRS); and the National Centre for Ports and Shipping (NCPS). The report describes research activities by national centres, and provides detailed information on the research interests and publications of AMC staff.

Examples of research collaborations outlined in the research report include Dr Neil Bose, Professor of Maritime Hydrodynamics, who was appointed during the year and is working in conjunction with the Memorial University of Newfoundland on building research capability with an autonomous underwater vehicle. Dr Martin Renilson was appointed as Professor of Hydrodynamics and, among other activities, is conducting an investigation into the dynamic stability of military platforms. Other maritime-engineering projects range from vessel wave-wake research, through ship-bank interaction and modelling of squat, to the study and management of non-native species invasions. The AMC's integration with the University of Tasmania, which took effect on 1 January 2008, provides opportunity for the AMC's research outputs to significantly increase in 2008 and beyond.

Copies of this report can be obtained by contacting Melanie Roome at m.roome@amc.edu.au

Final Year BE Research Theses 2008

A large variety of final year projects is being undertaken by maritime engineering students at present. A description of some of these projects is provided here.

Hydrodynamic Properties of a Suction Can in Subsea Lifting and Lowering — Chris Plummer, Bachelor of Engineering (Ocean Engineering)

Suction cans are a common type of foundation structure, widely used in the offshore industry. During offshore installation, when the suction can is lowered onto the seabed (or retrieved from depth to surface), the structure is usually handled by a crane or a winch on an installation vessel.

Due to vessel motions, the dynamic load on the crane is affected by the heave added mass and damping of the submerged structure, as well as by the stiffness of the lifting rigging. As the heave added mass of a suction can is usually very large (much higher than its own structural mass), dynamic loads experienced by the crane and the lifting rigging may be substantially higher than the submerged weight of the can. These dynamic loads govern selection of the installation vessel, design of the lifting rigging and define the allowable sea state under which the operation can be conducted safely.

Information on the hydrodynamic properties of the suction can is therefore important to make sure that the installation operation can be conducted safely and without unnecessary expenses incurred. Currently, such information is not available to offshore engineers in a systematic form.

This year Chris Plummer is conducting the third phase of research into the effects of added mass on a suction can as it is being lowered to the sea bed. The previous two studies (by Joel Ireland and Toby Roe, respectively) have looked at the effect of added mass in the middle-water column and the boundary effects as the suction can approached the bottom. This year the study is focusing on the hydrodynamic effect at the free surface and the effect of slamming. The objective is to determine the heave added mass and damping of a typical suction can when in the "splash zone" by the use of physical scale-model experiments. The dependency of both properties on the frequency and amplitude of heave motions will be assessed. Chris completed a comprehensive series of experiments in early May, and is now undertaking the post-processing of the collected data. The conduct of the experiments was enhanced by the attendance of Chris' industry supervisor, Dr Yuriy Drobyshevski.

This project is co-supervised by Gregor Macfarlane (AMC) and Dr Yuriy Drobyshevski of Intec Engineering, Perth, WA.

A Numerical and Experimental Investigation into the Prediction of Vessel Wave Wake for a Monohull, Catamaran and Trimaran — Daniel Mace, Bachelor of Engineering (Naval Architecture)

The primary aim of this study is to investigate the correlation between wave-wake predictions from physical model-scale experiments and a numerical technique, and to compare results for a monohull, catamaran and trimaran. These hullforms are the subjects of an existing research project being conducted by Justin Steel of Incat Crowther for a Master of Philosophy (by research, part-time) in which the resistance and seakeeping performance is being assessed.

The numerical analysis will be undertaken using Michlet, a prediction program based on Michell's Integral for thin ships, developed by Leo Lazauskas of the University of Adelaide who has kindly agreed to assist with the project. The first series of scale-model experiments on the three ship models is due to be undertaken in late May 2008.

This project is co-supervised by Gregor Macfarlane (AMC) and Justin Steel of Incat Crowther, Sydney, NSW.

Gregor Macfarlane

AMC Study contributes to $1.5 billion Port Expansion

Research by the AMC has contributed to Rio Tinto's recent $1.5 billion upgrade to its Parker Point iron-ore export facility at Port Dampier in Western Australia. AMC's investigation contributed to the determination of channel design, dredging requirements, safe environmental operating conditions and marine pilot training.

Increasing demand has led the AMC to establish a new Port Development Unit to work on resolving the nation's port congestion as Australia's resources boom continues. The unit brings together expertise already existing at the AMC in hydrodynamics, ship handling, channel design, logistics, port operations and environmental issues.

Greater demand for iron ore required an expansion of Port Dampier, almost doubling export capacity to 140 million tonnes per year.

The expansion entailed the installation of two new iron-ore ship loaders, which enables two vessels to be loaded 24/7 as ships enter and leave the other berth. A 600 m extension to the Parker Point wharf allows four carriers to be moored simultaneously.

In this configuration it is necessary for one ship to pass another when it is leaving the berth. When a moving ship passes a stationary one it will impart forces on it, somewhat like the forces exerted on a small car by a B-double passing too close. 'It is critically important, however,' said Dr Martin Renilson, Director of the Port Development Unit, 'that these forces do not cause motion of the berthed ship to exceed limits. Hundreds of thousands of dollars worth of damage can be caused, and the loading procedure interrupted, if this happens.'

The primary objective of the study was to determine whether the proposed separation of 50 m between the passing and berthed ships was adequate. The study took into account the likely manoeuvring speed of passing ships and the required depth of the channel.

Two of AMC's multi-million dollar facilities were used for the studies: the model test basin and the ship-handling simulator. The model test basin was geometrically modelled so as to accurately represent Port Dampier. Test results were then used as input to a mathematical model to predict the potential movement of the berthed carriers as they were passed by an enormous Cape-size vessel.

New channel layouts and the actual berths for Dampier were modelled on the ship-handling simulator, and marine pilots from Port Dampier participated in the study and continue to use it for valuable training.

We thank Rio Tinto Major Projects for their permission to publish the above details.

Gregor Macfarlane

University of New South Wales

Student–Staff Get-together

The naval architecture students and staff held a get-together on Thursday 3 April. This was to enable the students in early years to meet and get to know the final-year and post-graduate students and the staff on a social level, and to discuss the course and matters of mutual interest. Pizza, chicken, beers, wine and soft-drinks were provided and, after a slow start, conversation was flowing pretty freely an hour later! This year we have nineteen students in the third year (our largest-ever class of naval architects!), between eleven and fourteen in fourth year (some expecting to complete in mid-year), and half-a-dozen study-abroad students (from Germany, Norway and the USA), many of whom attended. Three full-time staff attended, as well as the Head of School (who is an honorary naval architect). A broad mix, with interesting discussions and some tall tales and true were told.

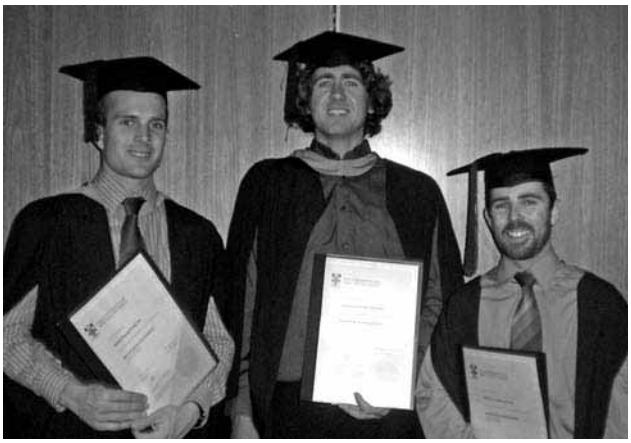
Graduation

At the graduation ceremony on 15 April, the following graduated with degrees in naval architecture:

Michael Halkes	H2/1
Kristofer Rettke	H1
Sam Shepherd	H2/1
Matthew Stevens	H1
Daniel Wong	H2/2

H1 Honours Class 1
H2/1 Honours Class 2 Division 1
H2/2 Honours Class 2 Division 2

A further few students have only their industrial training report or one course to complete and should graduate in May or October.



Kris Rettke, Sam Shepherd and matt Stevens
at UNSW Graduation Ceremony on 15 April
(Photo courtesy Amy Stevens)

Prize-giving Ceremony

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

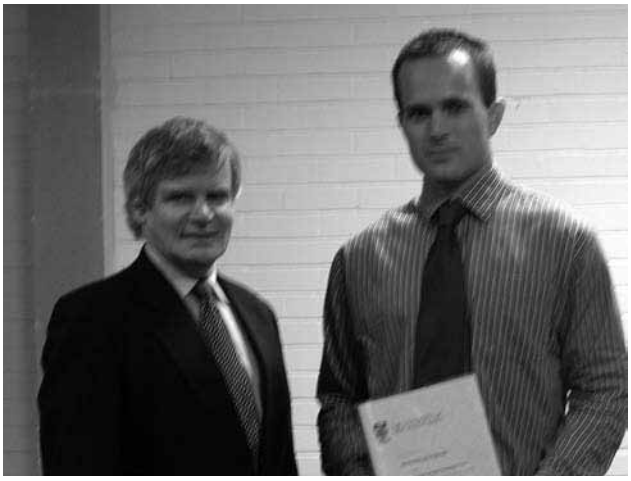
The Baird Publications Prize 1 for the best performance in Ship Hydromechanics A to Rowan Curtis.

The Baird Publications Prize 2 for the best performance in Ship Structures 1 to Rowan Curtis.

The Royal Institution of Naval Architects (Australian Division) Prize and medal for the best ship design project by a student in the final year to Matthew Stevens for his design of a 17 m composite cruising/racing yacht for a Port Douglas owner for voyages to Australian and international destinations.

Matthew Stevens (right) receiving the RINA (Australian Division) Prize and Medal from Phil Helmore
(Photo courtesy John Barron)

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



Kristofer Rettke (right) receiving the David Carment Memorial Prize and Medal from Phil Helmore
(Photo courtesy John Barron)

Congratulations to all on their fine performances.

Graduates Employed

Our 2008 graduates are now employed as follows:

Michael Halkes	diyi.com Ltd, Hong Kong
Kristofer Rettke	McAlpine Marine Design, Fremantle
Sam Shepherd	One2three Naval Architects, Sydney
Matthew Stevens	One2three Naval Architects, Sydney
Daniel Wong	Fulsail Shipyard, Sibu, Malaysia

Thesis Projects

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

Prediction of Forces for Sailing Simulation

Andrew Baglin is investigating the forces acting on sailing yachts for input to a sailing simulation program. This type of program is of interest to high-performance and match-racing sailors, as it can give guidance on when to tack for the quickest time to the next mark, or to tack in front of the competition. He will be using CFD to provide the forces for input to his own velocity-prediction program, relying on his

programming experience from a previous science degree.
Analysis of Near-surface Submarine Resistance

Brocque Preece is investigating the loss of speed of a submarine as it nears the water surface. When deeply submerged, the resistance has frictional and form components. However, as it nears the surface, a component due to wave making is added, and becomes increasingly important. He will be using CFD to investigate the resistance of the standard Defense Advanced Research Projects Agency (DARPA) Suboff hull-form at various depths using CFD. This will provide a basis for the loss in speed as the water surface is approached.

Post-graduate and Other News

Engineering Alumni Dinner

The Engineering Alumni Anniversary Dinner for 2008 will be held on Friday 19 September 2008 in Leighton Hall, Scientia Building, for the graduates of 1958, 1968, 1978, 1988 and 1998. So, if you graduated with Chris Hughes and Brad Hillman (1998), Ian Morton and Trevor Rabey (1988), Marino Gomes and Clive King (1978), or Richard Caldwell and Philip Hercus (1968), then you should be dusting off the tux or cocktail dress, polishing your shoes and asking your partner to keep the evening of Friday 19 September free.

Watch this space for updates, or check the Engineering website www.eng.unsw.edu.au/news/index.htm.

New Dean for Faculty of Engineering

Prof. Brendon Parker has retired from the position of Dean of Engineering at UNSW after five years in the top engineering job, where he was listed in 2006 as one of the 100 most-infuential engineers in Australia by *Engineers Australia*.

Prof. Diane Wiley took the chair as Acting Dean of Engineering until the appointment of the new Dean. A chemical engineer, Professor Wiley is also Deputy Director of the UNESCO Centre for Membrane Science, and she was listed in 2007 as one of the 25 most-influential female engineers in Australia by *Engineers Australia*.

The new Dean of Engineering, Prof. Graham Davies, who took up his position in mid-March, comes to UNSW from the University of Birmingham, where he occupied the position of Chance Professor and Executive Dean of the School of Engineering. Professor Davies is an internationally-respected academic in the fields of nanotechnology and electronic and telecommunications engineering. Prior to joining the University of Birmingham in 2001, Professor Davies was General Manager (Vice President) of Technology Acquisition and International Development at British Telecom Research Laboratories, one of the largest industrial research laboratories in the UK. He is a Fellow of the Royal Academy of Engineering, a Founding Fellow of the UK Institute of Nanotechnology and a Fellow of the Institution of Electrical Engineers. He has been Chairman of the UK Engineering and Physical Sciences Research Council's Review Panel for Nanotechnology, Chair of the Materials UK Science and Technology Committee and has an extensive record of publications and patents.

New Head of School for Mechanical and Manufacturing Engineering

Prof. Hartmut Kaebernick will retire as Head of the School of Mechanical and Manufacturing Engineering on 31 August. However, he is on long-service leave from 31 March until then, and so has effectively retired already. Hartmut came to UNSW from the CSIRO's Division of Manufacturing Technology, having worked for a number of companies in Germany, including Siemens and Hauni-Werke Koerber, and has been Head of School since 2003. Prof. Eddie Leonardi has been appointed Acting Head of School until 31 August.

Staff Changes

Prof. Bob Randall has retired from teaching at UNSW. Bob is a world authority on vibrations and the burgeoning field of condition monitoring, and provided consultancy services to the Australian Defence Forces on the vibrations of the gearboxes in their helicopters. He will be remembered by many students for providing their thorough grounding in vibrations. Bob will remain at UNSW as an Emeritus Professor and continue his research activities.

Dr Michal Tordon has retired from teaching at UNSW. Michal is a mechatronics engineer, and taught computer control systems, digital logic, microprocessors and programming. He will be remembered by naval architecture graduates mostly for teaching computing in Year 1 and engineering experimentation in Year 3.

Staff hired recently to fill the vacancies include Prof. Robert Parker (research and vibrations), Dr Nathan Kinkaid (applied mechanics) and Dr Jose Guivant (mechatronics).

Phil Helmore

23IWWWFB

The 23rd International Workshop on Water Waves and Floating Bodies was held in Jeju, Korea, on 13–16 April 2008. A total of 47 papers on all topics associated with water waves was presented at this prestigious annual workshop. Most of the papers were devoted to the matter of wave impact on floating structures. However, some of the papers dealt with waves generated by ships and the influence of waves upon ships.

There was one Australian contribution: Professor Lawrence Doctors from UNSW discussed his research on the topic *The Unsteady Growth of Ship Waves in a Towing Tank*. In this paper, Lawry described an extensive set of towing-tank experiments at the Australian Maritime College on the wave generation of three geosim catamaran models. These tests were conducted in order to test the predictive ability of unsteady linearised wave theory. It was demonstrated that it is essentially impossible to achieve the steady-state wave pattern in a typical towing tank in the region of the depth-critical speed. The problem relates to the limited length of any practical towing tank. This is a serious matter when the depth Froude number is close to unity. However, the new theory can be used with confidence to predict the incompletely-developed wave system behind the model.

There were eleven other papers which dealt with ship hydrodynamics, particularly with respect to the motions in waves and the sloshing of water in tanks. These will also be of interest to RINA members.

Readers of *The Australian Naval Architect* can download the papers from the IWWWFB website. Indeed, the papers from the proceedings of all 23 Workshops have now been uploaded to this website, thus providing a most useful and beneficial tool to naval architects and ocean engineers. Visit www.iwwwfb.org and, at the top left, there is a list of all workshops and their locations. Click on the desired workshop, and then click on the desired paper for download in PDF format.

The 24th International Workshop on Water Waves and Floating Bodies is scheduled to take place in Zelenogorsk, Russia, on 19–22 April 2009.

Experimental and Theoretical Study of Ship Resistance with Unsteady Forward Speed

Emeritus Professor Lawrence Doctors from UNSW recently spent a four-week period in the Department of Naval Architecture and Marine Engineering at the Universities of Glasgow and Strathclyde, in Glasgow, Scotland. His co-workers were Dr Sandy Day and Mr David Clelland. Their project was initially inspired by a desire to better understand the resistance characteristics of racing shells, in which the velocity varies by up to 20% from the average value during the rowing cycle. This large variation is due to the very considerable inertia of the rowers. Thus, as the rowers move backwards and forwards while they row, the shell moves in the opposite direction in accordance with Newton's Law.

This interesting fact suggests that the average resistance of the shell may not be the same as that based on a simple approach (either via experiment or theoretical means), in which one considers just the straightforward average speed. Because races involving such rowing shells are won by fine margins, even a small improvement in the design of these hulls will have a great impact on the outcome of the race.

As a first step, tests had already been conducted in the Acre Road Towing Tank of the Universities of Glasgow and Strathclyde on what one might traditionally refer to as steady tests on a ship model. Even in such elementary tests, the unsteady effects from the starting acceleration phase of the tow can be discerned during the experiment. These effects can also be accurately predicted using the unsteady form of the wave-resistance theory, initially developed by Michell (1898). The unsteady theory was first published by Lunde (1951). Wehausen (1964) published a very simple formula for estimating the magnitude and the phasing of the unsteady oscillations in the model resistance as it progresses along the tank, for the case of deep water. This previous research has been confirmed by the current investigation and it is the subject of a paper recently accepted for publication by the *Journal of Ship Research*.

The more-recently conducted tests in Glasgow are for the challenging case of unsteady forward motion. For these tests, the model was driven by a computer-controlled sub-carriage attached to the main towing carriage, so that it would undergo a sinusoidal variation in speed. Preliminary calculations have confirmed the very substantial unsteady influences on the resistance of the model. For example, we have demonstrated that the wave resistance of the model in typical conditions can become negative during a large part of the oscillatory motion. The unsteady theory is in close agreement with the theory, while the classical steady theory (applied in a quasi-steady manner) is not.

Unsteady forward-motion tests in the Acre Road Towing Tank at the Universities of Glasgow and Strathclyde
(Photo courtesy Lawry Doctors)

This work has been supported by the Sir David Anderson Bequest Award, at the Universities of Glasgow and Strathclyde, and by the Engineering and Physical Sciences Research Council (EPSRC) in the United Kingdom.

Lawry Doctors

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Doctors, L.J., Day, A.H., and Clelland, D., Unsteady Effects during Resistance Tests on a Ship Model in a Towing Tank, *Journal of Ship Research*, Accepted for publication, 13 pp (December 2007).

Lunde, J.K. (1951), On the Linearized Theory of Wave Resistance for Displacement Ships in Steady and Acceler-

ated Motion, *Transactions*, Society of Naval Architects and Marine Engineers, v.59, pp.25–76, Discussion pp.76–85, December.

Michell, J.H. (1898), The Wave Resistance of a Ship, *Philosophical Magazine*, London, Series 5, v.45, pp.106-123.

Wehausen, J.V. (1964) Effect of the Initial Acceleration upon the Wave Resistance of Ship Models, *Journal of Ship Research*, v.7 n.3, pp.38–50, January.

Curtin University

Under-keel Clearance Validation in Torres Strait

It is critical for ship operations to have accurate information on the clearance between the keel of a ship and the sea bed. Such information allows the cargo-carrying capacity of the ship to be maximised with minimal risk of the ship running aground. In February 2008, The Centre for Marine Science and Technology (CMST) at Curtin University performed a set of full-scale trials on 11 ships transiting the Torres Strait. The trials used GPS surveying techniques to measure the squat, heel and trim of the ships, by comparing the ship GPS elevations of each to those of an accompanying escort vessel. Measured data was compared to predictions by the ship under-keel clearance software *KeelClear*, developed by CMST for Voyage Management Systems and Australian Reef Pilots, which is currently in use in the Torres Strait. The trials were part of the ongoing validation process for the Australian Maritime Safety Authority.

Escort vessel with the container ship *Windarra* during trials
(Photo courtesy Curtin University)

SPH Study of High Speed Ship Slamming

Numerical modelling of extreme motions of large floating objects in ocean waves has met with only limited success using available techniques in computational fluid dynamics, particularly when wave impacts are involved. In recent years the smoothed-particle hydrodynamics (SPH) method has been developed for non-marine applications and there is a growing realisation that use of SPH might improve fluid-structure interface models. Curtin University PhD student Daniel Veen is developing a SPH code to study slamming in high-speed ships.

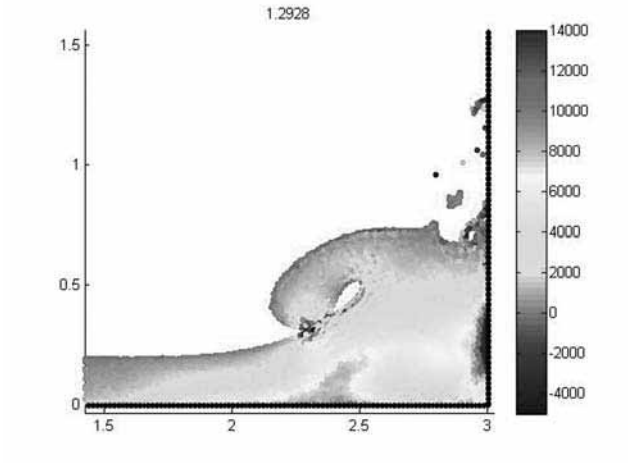
Currently, a 2D version of a schematic dam break has been simulated (see illustration below) and the results compared favourably with experimental results

Preliminary work applying the SPH method to impact problems involving two-dimensional wedges striking a water surface is now under way. In later stages of the project the wedge will be replaced by two-dimensional hull shapes similar to those used by Davis and Whelan (2007). Finally, a two-phase problem involving both air and water will be applied to replicate the Davis and Whelan experiments using SPH.

Reference

Davis, M. R., and Whelan, J. R., 2007, Computation of Wet Deck Bow Slam Loads for Catamaran Arched Cross Sections, *Ocean Engineering*.

Kim Klaka



Simulation of dam break
(Image courtesy Curtin University)

Sailing on Sydney Harbour gave way to powerboats on the weekend of 8-9 March for the inaugural Sydney Superboat Grand Prix. The harbour was closed for the event which attracted only modest spectator numbers and many yachties, completely underwhelmed, were heard muttering in their beer
(Photo John Jeremy)

First Wave of NSCV to Enter National Legislation

The National Marine Safety Committee announced in early March the upcoming implementation of its National Standard for Commercial Vessels (NSCV) into national legislation. The first wave of implementation will take full effect in Part C, Design and Construction, of the NSCV from 1 October 2008. The legislation will apply to new vessels, but marine safety agencies may require existing vessels which are upgraded or modified to comply with the NSCV provisions.

The NSCV is a technical standard for the design, construction and operation of domestic commercial vessels. It replaces the Uniform Shipping Laws (USL) Code and is a major move towards a common national safety standard for the regulation of commercial vessels. From October, those parts of the NSCV for design and construction which have been completed will formally replace existing USL Code requirements.

CEO of the National Marine Safety Committee (NMSC), Maurene Horder, said the implementation will ensure that the latest standards apply, as well as introducing new standards into legislation on a six-monthly or yearly basis as they develop and are nationally agreed by all governments. "The national implementation of the NSCV will affect boat designers and builders and will, at the same time, bring added flexibility" Ms Horder said. "For instance, vessels built throughout Australia will now be able to legally apply the performance-based and less-prescriptive aspects of the NSCV to meet construction safety standard requirements".

The raft of standards poised to enter national legislation from October includes:

- The fire-safety requirements of NSCV Part C, Section 4 (with some differences in South Australia and Queensland).
- The engineering requirements of Part C, Section 5 (covering machinery, electrical and LPG systems).
- The safety-equipment standards of Part C, Section 7A (except in Queensland and with some differences in South Australia).
- The fast craft requirements of Part F, Section 1.

It will be legally required from 1 October 2008 that all new vessels comply with the specified completed and approved NSCV standards. However, where a vessel submits an application prior to October, that vessel is not required to comply with the NSCV, provided that construction work begins within a three-year period. "This allows a transitional period for vessel builders over the next six months," Ms Horder added.

For the combined USL Code/NSCV 2008 version of which standards apply to all new vessels, visit the NMSC website: www.nmsc.gov.au, and click on the 'Legislated standards 2008' icon on the home page.

The NMSC aims to achieve nationally-uniform marine safety practices and is made up of the CEOs of state and NT marine safety agencies.

For further information contact CEO, Maurene Horder, or Communications Officer, Rosemary Pryor, on (02) 9247 2124.

Fire safety equipment training at the Australian Fisheries Academy, South Australia
(Photo courtesy Maureen Jones)

ATC Approves Four Sections of NSCV

The Australian Transport Council of Ministers has endorsed four significant marine safety standards in the design-and-construction section of the National Standard for Commercial Vessels (NSCV).

The new standards, developed by the National Marine Safety Committee (NMSC) in consultation with industry, are Construction (Part C Section 3), Intact Stability Requirements (Part C Section 6A), Stability Tests and Information (Part C Section 6C), and Anchoring Systems (Part C Section 7D).

NMSC's CEO, Maurene Horder, said that the ATC approval marks an important step in progressing modern standards for new vessels around Australia. "Each of the four new standards was achieved after a lengthy process of consultation with stakeholders to modernise our standards and to assess the impact on the industry," Ms Horder said. "The construction standard is particularly broad in its reference as it was developed in conjunction with Lloyds Register after they successfully tendered to assist NMSC."

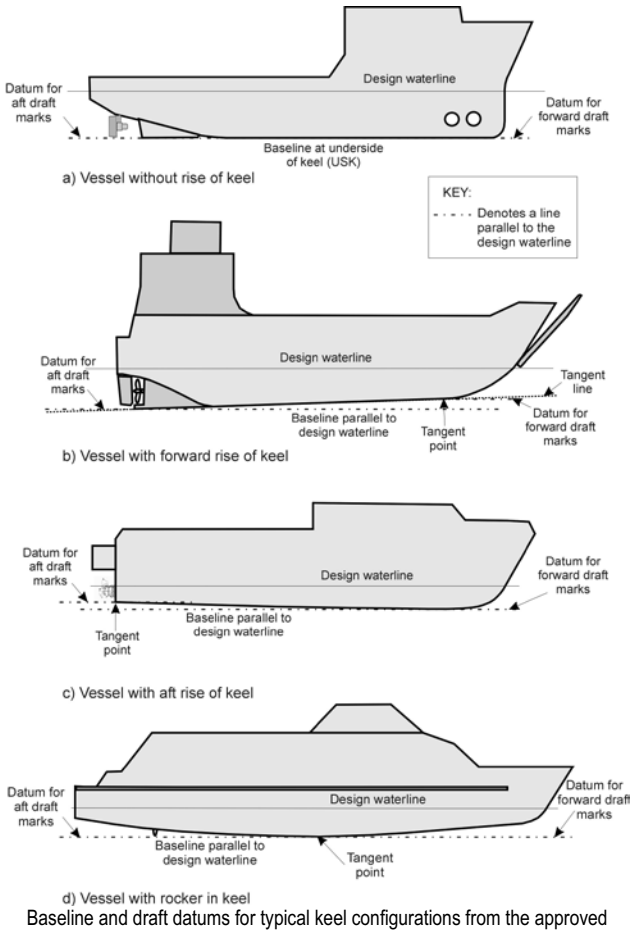
Key outcomes include:

- The new Construction standard (Part C Section 3) recognises new or replaceable construction materials and the adoption — where at all possible — of existing national or international standards.
- The Intact Stability Requirements standard (Part C Section 6A) aims to reduce the risk of capsize or excessive heel of a vessel. The standard also provides a consistent and auditable benchmark for determining initial and ongoing compliance to the standards.
- The Stability Tests and Information standard (Part C Section 6C) fine tunes stability information under the whole range of operating conditions. For instance, it updates information on draft marks and the presentation of information includes comprehensive diagrams.
- The new standard for Anchoring Systems (Part C Section 7D) features innovation in testing requirements and consideration for all types of hulls such as catamarans and trimarans. The method for calculating anchor mass has also been simplified.

The new approved standards are available for application now and are expected to be made mandatory for new vessels — i.e. introduced into national legislation — in approximately 12 months' time.

The documents can be viewed and downloaded from the NMSC website www.nmsc.gov.au; click on Publications, then National Standards.

Further information may be obtained from CEO, Maurene Horder, or Communications Officer, Rosemary Pryor, on (02) 9247 2124.



Baseline and draft datums for typical keel configurations from the approved NSCV C6C Stability Tests and Stability Information

(Diagram courtesy NMSC)

Anchor Right in Victoria tests anchors according to the approved National Standard for Commercial Vessels — Anchoring Systems

(Photo courtesy Foster Mirror)

Stability and Safety

Marine Accident Report NTSB/MAR-06/03 reports on the investigation conducted by the National Transportation Safety Board (USA) into *The Capsizing of New York State-Certificated Vessel* Ethan Allen*, Lake George, New York 2 October 2005*, as a result of which several passengers died. The investigation found that "the combination of too many passengers, as permitted by *Ethan Allen*'s inappropriate COI, and the use of an out-of-date average weight standard for passengers on public vessels, resulted in *Ethan Allen* carrying a load that significantly reduced its stability, which made it more susceptible to capsizing on the day of the accident".

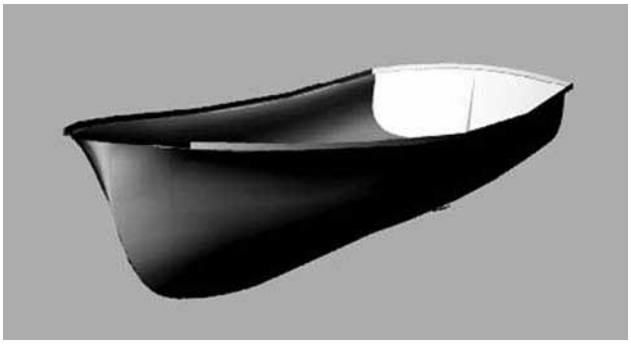
In the course of the investigation, the NTSB carried out a stability test on *de Champlain*, a sister vessel to *Ethan Allen*, and extensively modelled the stability characteristics.

The report emphases the importance of having a national marine safety standard for stability in Australia, and of having an up-to-date value for the standard mass of each passenger.

Rosemary Pryor

de Champlain after NTSB's on-site stability assessment was terminated

(Photo from report NTSB/MAR-06/03)



Model of *Ethan Allen*'s hullform used in stability assessment

(Image from report NTSB/MAR-06/03)

COAG Focus on Marine Safety

Marine safety administration is now sitting higher on the Council of Australian Governments' (COAG) agenda. In a new model of cooperation, COAG has formed seven working groups to oversee and progress change in key areas. The work programs of three of these working groups will impact on marine safety.

The *Business Regulation and Competition* working group

aims to minimise unnecessary costs to industry arising from the operation of both State/Territory and Commonwealth maritime legislation. The focus is currently on a single national approach to maritime safety for commercial vessels. This is consistent with the objectives of the NMSC and will provide a much-needed fillip by giving marine matters some national attention.

The *Productivity, Education, Skills and Early Childhood* working group will pursue reform in the areas of education, skills and vocational education and training.

The *Infrast4ructure* working group agreed that a more nationally-coordinated approach to further infrastructure reform is critical to enhance Australia's future economic performance and raise national productivity.

On top of these working groups, the existing COAG *Skills Recognition Task Force* continues to review the equivalences of maritime qualifications in order to streamline the mutual recognition of qualifications around Australia. This group involves all marine safety agencies in matching and equating the array of marine qualifications and exects to complete this job later this year.

Workshop Explores New Directions for Leisure Vessels

Forty stakeholders including representatives from industry, regulators and boating-interest groups recently explored the proposed replacement in the National Standard for Commercial Vessels for Section 18 (Hire and Drive) of the Uniform Shipping laws Code. Organised by the National Marine Safety Committee, the workshop took place in Sydney in March to consider the scope and direction of the proposed new standard.

NMSC's Team Leader, John Henry, said that it was clear, from the discussion, that this market sector had expanded considerably over the past twenty years with bare boats, boats hired on a trailer, and other operations involving more responsibility on the part of the hirer, now on the scene.

"These operations supplement traditional hire-and-drive and houseboat operations," Mr Henry said. "We sought to match the practical experience of operators with some conceptual models for managing risk — and we evaluated how this sector is regulated in other developed countries. The discussion was wide ranging — even the proposed name for Section F2 of the NSCV, 'Commercial Leisure Vessels', was debated and is currently up for discussion".

An issues paper seeking broader public input into the development of a standard for the NSCV, Part F Section 2 — Commercial Leisure Vessels, will be released shortly.

Safety Lines, April 2008

INDUSTRY NEWS

Large Jet Units

Doen Pacific Pty Ltd is currently manufacturing a 35 inch (890 mm) diameter waterjet at its Melbourne facility, and this will be the largest waterjet built in Australia. The DJ350 is being supplied, as part of a triple waterjet propulsion package, to an Italian motor-yacht builder to be used as a booster jet in a new 42 m motor yacht.

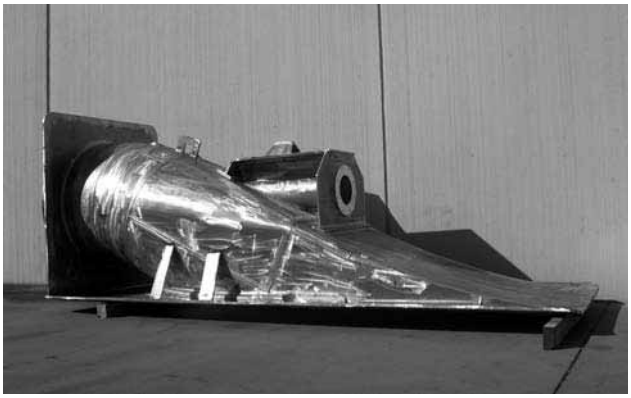
Two DJ290 [29 inch (740 mm) diameter] wing jets, driven by Caterpillar C32 engines of 1342 kW brake power each through ZF gearboxes, will provide cruise propulsion and manoeuvring. The booster jet, driven by a Vericor TF50 3,800 kW gas turbine through a custom ZF gearbox, will provide a sprint speed estimated at 37 kn. The wing jets will give an economical cruise speed of 15 kn and continue to perform efficiently when used in combination with the booster jet at high speeds.

The DJ350 booster jet is an axial-flow design, as are the DJ290 wing jets, but with a boss design which skews the flow more towards mixed flow than axial flow. The Doen pump design provides efficient performance over a wide speed range, with the benefit of simplified construction of the parallel-pump casing. There is also excellent tolerance to off-design conditions, such as changes in trim angle or increased displacement, which can cause cavitation in a mixed-flow jet.

Construction comprises a fabricated and machined aluminium duct, supplied complete and ready to weld into the hull structure. The pump unit, including the stator, housing and nozzle, is fabricated from stainless steel and bolts to the duct aft of the transom. Hydraulics, limited on this booster jet to a nozzle flap which is used to close off the jet when not in use, are kept inside the hull, as they are with all Doen's larger jet units.

This method of construction gives a compact, lightweight and extremely-durable jet unit which can be welded directly into aluminium hulls. The custom-fabricated duct allows it to be tailored to suit any hull design, unlike cast units which force the designer to design the hull afterbody to suit the jet. Doen has found that large aluminium castings are inefficient in terms of weight, strength and erosion resistance.

To further simplify the design, the thrust bearing has been removed from the jet (normally mounted on the tunnel top with the shaft seal) and is mounted separately.



Doen DJ350 waterjet
(Photo courtesy Doen Pacific)

Doen Pacific

Doen Pacific Pty Ltd has been designing and manufacturing Doen Waterjet Propulsion Systems in Melbourne since 1970. Over 35 years of commercial operational, design and manufacturing experience, in conjunction with their ongoing

research and development programs, ensures that their current range of waterjet models offer outstanding performance and reliability. All models are built to meet the exacting standards of the marine classification societies.

Doen Pacific's expertise in waterjet propulsion application and installation ensures correct selection and matching of the Doen waterjets to marine engine combinations from 100 kW to over 3000 kW. Doen waterjets are currently in operation in many countries throughout the world, having gained a worldwide reputation for reliability, simplicity, performance, service and support.

Contact

For further details, contact Doen Pacific Pty Ltd, phone (03) 9587 3944, fax (03) 9587 3179, email inquiries@doen.com, or visit their website www.doen.com.

SCHIFFKO to Design European Research Icebreaker

Wärtsilä's ship design and marine consultancy subsidiary, SCHIFFKO GmbH, based in Hamburg, has been awarded a contract from the Alfred Wegener Institute for Polar and Marine Research of Bremerhaven, Germany, to design the revolutionary new European research icebreaker *Aurora Borealis*, which will have a deep-sea drilling capability.

The contract, which was won in a public tender, comprises the initial design concept, general arrangement planning, and full tender documentation. The ship will facilitate research in ice and open-water conditions in the fields of geology, geophysics, oceanography, biology, glaciology, bathymetry, meteorology, and atmosphere physics.

Aurora Borealis will set new standards in the fields of polar research and naval architecture. Currently, no polar research vessel has the capability to autonomously navigate in pack ice outside the summer season. *Aurora Borealis*, in contrast, is planned as a multi-purpose icebreaking research vessel for Arctic and Antarctic operations, with the capability to autonomously navigate in ice with a thickness of up to 4.5 m. This will for the first time make possible all-year-round research on, for example, the effects of global climate change.

The ship will have the unique capability to perform scientific deep-sea drilling operations at water depths of up to 5000 m with a penetration of up to 1000 m, even when amid drifting pack-ice fields. An innovative, high-performance dynamic-positioning system will enable the ship to keep position in such a demanding environment.

The *Aurora Borealis* project is a major strategic European science infrastructure development for the next generations of polar researchers. The vessel will have a length between perpendiculars of 165 m, the highest icebreaker classification, and more than 55 MW of propulsive power, thereby considerably outperforming all currently-operating research icebreakers. Yet machinery onboard *Aurora Borealis* will be highly energy efficient, environmentally friendly, fully redundant, and allow for reliable and safe operations in the most remote and hostile polar regions.

SCHIFFKO's main challenge under this contract is to provide an innovative, technically-sound and convincing ship design concept which optimally combines the wide range of tasks specified for *Aurora Borealis* by the international scientific community. This tough challenge is one that SCHIFFKO intends to master, as it did some twenty-five years ago when it designed the then revolutionary, and now legendary, icebreaking research vessel *Polarstern* for the Alfred Wegener Institute.

Daewoo to join BAE in MoD bid

BAE Systems, the UK-based defence specialist, has joined forces with Daewoo Shipbuilding in South Korea to bid for the contracts to build a fleet of new tankers for the UK Ministry of Defence, heightening speculation that the MoD will have the vessels built overseas.

The consortium, which also includes BMT Defence, has submitted its initial proposal following the MoD announcement that it was looking for expressions of interest to build up to six tankers. The vessels will form the first part of the Military Afloat Reach and Sustainability (MARS) programme.

BAE Systems will act as lead contractor and programme manager, BMT will be the design partner and the ships will be built by DSME.

The final budget for the MARS programme is thought to be about £2.5bn, although the MoD has yet to announce its final budget allocation for the year, raising suspicions that the project may be subject to similar cuts and delays feared for the proposed pair of Royal Navy aircraft carriers.

While the MoD has been promoting naval procurement to be as commercial and competitive as possible, there has been a cautious approach to the possibility of the vessels being built overseas. The First Sea Lord, Admiral Sir Jonathon Band, while not ruling out foreign yards, has expressed a desire to find a UK alternative if financially viable.

However, BAE Systems Director of Auxiliary Projects, Scott Jamieson, says that the MARS project could overlap with the aircraft carrier plans.

If that happened, he fears there would not be any available space to build the first MARS tankers in the UK for delivery by 2012.

"The MoD wants to make as much use of commercial capability as possible and Daewoo is one of the biggest tanker builders. Their facilities are impressive and they have a naval yard on the same site as the commercial work, so they have naval experience," he said.

The long orderbook for commercial vessels at Daewoo is not a problem either, according to Mr Jamieson.

"Daewoo has these two small docks which are being used for naval construction, but are too small for the large commercial vessels being built," he said. "The MoD tankers will be under 200 m long and this will be the right size for these."

It is anticipated that the MoD will assess the initial responses. A final decision on who wins the contract is not expected until April 2009.

Craig Eason
Lloyds List, 18 February 2008

VALE

Keith Wood

It is with sadness that *The ANA* records the passing of Keith John Wood on 4 March 2008 following a short illness.

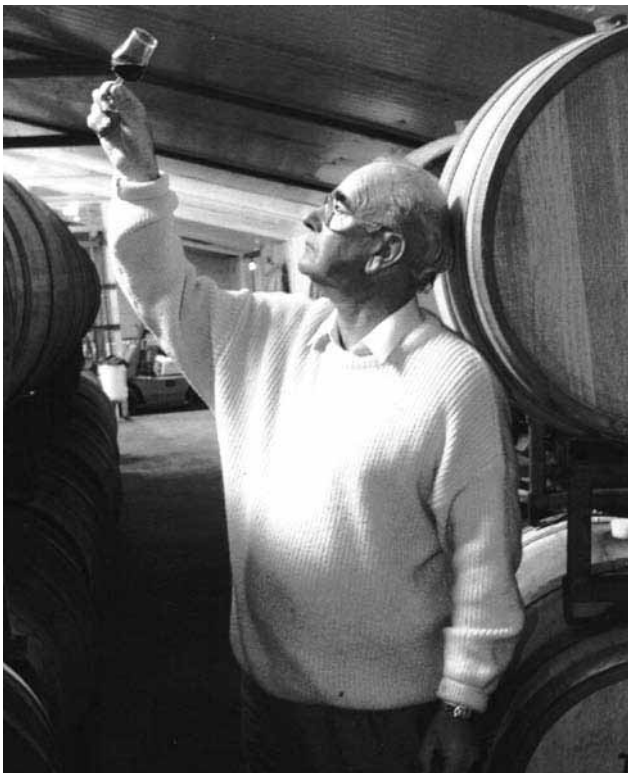
Keith was born in 1942 in country Victoria and raised on his aunt and uncle's farm at Minyip in Western Victoria. Minyip was a special place for Keith, so much so that his special request was to be buried in this small country town, a request which was fulfilled on 11 March with a graveside service.

Keith's working life commenced in the 1960s as a cadet engineer with the Government Ordnance Factory. Completing his studies in mechanical engineering at the Castlemaine Technical College, he then moved on in 1967 to the Department of Navy in Canberra for two years before taking up a naval architect position with the same organisation in Sydney. Here Keith took the opportunity to complete his studies in naval architecture, graduating from the University of New South Wales with a Bachelor of Science (Engineering) degree and, later, completing a post-graduate Master of Engineering Science degree. His bachelor and master degrees were both studied for part-time, the latter being completed while Keith occupied responsible positions with the then Australian Shipbuilding Board and later the Australian National Line.

In his time with the Department of Navy, Keith occupied a number of supervisory and management positions covering vessel design, construction, repair, maintenance, modifications and trials, culminating in the position of Hull Overseer at Cockatoo Island Dockyard. From there he moved on to the Australian Shipbuilding Board, where he took an active role in the design of merchant ships being built in Australia under the government subsidy scheme.

In 1973 Keith moved on to the Australian National Line (ANL) where he was, firstly, Manager of New Ship Construction and, later, in 1981, Container Manager. At the time, ANL was a significant global ship operator, having anything up to eight ships under construction at one time around the world. In addition to managing the various construction contracts, Keith also played a significant role in a number of ship-lengthening projects and led complex design studies, such as those for new and revolutionary ways to load and carry steel slabs and coils. In his later role as Container Manager, Keith reorganised and managed ANL's large worldwide container operation, turning it from a loss to a profit. One of the innovations of which Keith was very proud in this role was the development of a unique floating ramp for the loading and discharge of roll-on/roll-off ships.

In 1983 it was time for a change of pace. Parting company with ANL, Keith moved into general consulting and operations management with a variety of businesses, including Benchmark Marine Services (a general marine consultant), Inroads Technology (a subsidiary of BP Petroleum), Shepparton Irrigation and the Victorian Department of Business and Employment. In all his various roles with these entities, Keith had to innovate, apply new technology to old problems, develop new ways of doing business, and resolve problems with customers — surely demonstrating a wide range of skills.



Keith Wood
(Photo courtesy Annelies Wood)

Returning to the large-scale marine industry in 1993, Keith worked first with Transfield Shipbuilding, its successor Tenix, and then Sinclair Knight Merz (SKM). With Transfield/Tenix Keith was involved with the Offshore Patrol Vessel, where he was responsible for the machinery design, the LPA conversion project (HMA ships *Kanimbla* and *Manoora*), where he was responsible for mechanical aspects of the design, and the Tenix FFG upgrade proposal, ultimately becoming Technical Authority for the Tenix Anzac Ship Project. Moving on to SKM, Keith then became that company's Executive Engineer/Technical Authority for mechanical engineering and naval architecture. Here he was responsible for all mechanical engineering and naval architectural matters within SKM's Naval and Merchant Marine Operations Centre. From January 2006, Keith was Shipbuilder Principal Naval Architect for the Air Warfare Destroyer Hobart-class Program and was based at the Air Warfare Destroyer Systems Centre in Adelaide.

In January 2008, Keith was awarded a Maritime Systems Award Commendation by the Chief Naval Engineer, CDRE Peter Marshall, for his "outstanding contribution to Naval design and updates and, particularly, his role as Principal Naval Architect for the Hobart-class Air Warfare Destroyer."

Keith freely shared his expertise and passion for ships through his involvement with the Australian Maritime College, his co-workers around the world, and his mentoring of the next generation of Australian naval architects, marine engineers, and shipbuilders. Keith's genuine love of ships, unselfishness and uncompromising passion in supporting and sustaining these critical skills for Australia's future was relentless and unquestionably his calling in life. If he could talk, teach, design, or share a story with an eager ear,

then it would undoubtedly be about ships. Keith was able to reach a pupil, or an entire audience, through his unchallenged knowledge, attention to detail, and tireless efforts to not compromise.

In his other life, Keith enjoyed watching Australian Rules football and was a proud Collingwood supporter. He was also an energetic vigneron, having taken over a run-down vineyard near Lethbridge in Victoria in 1990. Over the years, Keith progressively upgraded the vineyard and its associated wine-making facilities to produce premium-quality wine. He also provided specialised engineering advice to a number of individuals and companies in the same field.

In late 2007 Keith was operated on for recurrence of a melanoma for which he had been treated some years ago. Aggressive treatment was not successful and Keith died on 4 March 2008. His remains were interred at a graveside service at Minyip on 11 March, followed by a Memorial Service at Grovedale, near Geelong, on 12 March. He is succeeded by his wife, Annelies, and his children, Karen and Mark.

MEMBERSHIP

Australian Division Council

The Australian Division Council met on Wednesday 19 March 2008 and this meeting, as usual, was conducted as a teleconference.

Matters discussed by Council were varied and included the following:

The Basic Dry Dock Training Course

In response to enquiries asking if this course offered in the UK could be made available in Australia, Council had been advised that London would be providing the course in Australia and negotiations for a suitable venue were presently taking place. Members would be advised from London when details became firm.

150th Anniversary of RINA

It was reported that a Select Committee had been established by the RINA Council meeting recently in London to determine how best the 150th anniversary of the formation of RINA night be celebrated in 2010. The Division President, Dr Stuart Cannon, was nominated to a position on that committee and he had accepted the nomination.

The Pacific 2008 International Maritime Conference

Mr Jeremy, Chairman of the Organising Committee, reported on the success of the conference which was attended by about 360 registrants. During his visit to Australia for the conference, the Chief Executive of RINA had the opportunity of meeting many of those attending and Council expressed its thanks to those members who had provided assistance by crewing the RINA stand during the conference.

Approval for Formation of a Section in South Australia

Mr Crosby presented a paper seeking Council approval for the formation of a Section of the Australian Division in South Australia. It appeared there was sufficient support to form a Section Committee and, if formed, the Section would continue its association with the local branch of IMarEST by way of joint technical meetings. Council supported the inclusion of RINA members in the North Territory in any activities of South Australia and formally approved of the formation of the South Australia and Northern Territory Section of the Australian Division of RINA.

The next meeting of the Council of the Australian Division is scheduled for Wednesday 25 June 2008.

Australian Division Annual General meeting

The Annual General Meeting of the Australian Division of The Royal Institution of Naval Architects was held in the Campbell Park Offices of the Department of Defence, Canberra, ACT, on Wednesday 19 March 2008. The meeting was attended by members of the ACT Section and visiting members from other Sections.

There was little discussion of the Agenda Items as published in the notice for the AGM in the February issue of *The Australian Naval Architect* and the Secretary announced, in accordance with the By-Laws of the Division, the appointment of the following members of Section Committees to Council:

Ms Samantha Tait (Vic)
Mr Chris Hutchings (Qld)
Mr Roger Best (WA)
Mr Craig Boulton (NSW)
Dr Giles Thomas (TAS)

Following the conclusion of the AGM, John Jeremy gave an informative address entitled *The Twenty-first Century Passenger Ship — Queen Mary 2.*

Keith Adams
Secretary

Free Papers for Members

Members should be aware that they are entitled to five free copies of RINA papers each year. This includes papers from previous transactions, conferences, etc., and is especially useful if you are interested in just one or two papers from a particular conference, as you don't then need to buy a copy of the entire proceedings.

The procedure for obtaining a copy is to email your request to publications@rina.org.uk, with the subject line "Member's Free Paper", and specify the author(s) and year, the title of the paper, where the paper appeared (transaction year/volume, conference name and year, etc.) and, finally, your name and RINA membership number.

Phil Helmore

MISSING IN ACTION

There is only one member missing in action — Mr R A Bryce MRINA and whose last-known address was 33/27 Ithaca Road, Elizabeth Bay NSW 2011.

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.

NAVAL ARCHITECTS ON THE MOVE

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

Matthew Addison has moved on from Rolls Royce and has taken up a position with Offshore Marine Services in Perth.

Tony Armstrong (the younger) has moved on from Teekay Shipping and has taken up a position with Leif Hoegh and Co., and is now managing their Neptune Project at Samsung Heavy Industries' shipyard in Geoje, Korea.

Andrew Baglin, a student at the University of New South Wales, has taken up a part-time position with One2three Naval Architects in Sydney while he completes the requirements for his degree.

Joshua Bolin, a student at the University of New South Wales, has taken up a part-time position with Peter Lowe Design in Sydney while he completes the requirements for his degree.

Dawei Cai has moved on from Cardno and has taken up a position as a naval architect with ASO Marine Consultants in Sydney.

Darren Collopy, a recent graduate of the Australian Maritime College, has taken up a position with BMT Defence Services (Australia) in Melbourne.

Andrew Cooper returned to Australian Marine Technologies in Melbourne, following a secondment to Blohm + Voss in Hamburg, in 2004. He has subsequently been on a year-long secondment to Thyssen Krupp Marine Systems in Canada, and recently returned to AMT in Melbourne.

Simon Crook has moved on from Australian Marine Technologies and has taken up a position with Marshall Lethlean, a manufacturer of road tankers, in Melbourne.

Katrina de Graaf, a recent graduate of the Australian Maritime College, has taken up a position with the Major Surface Ships Division of the Defence Materiel Organisation in Canberra.

Gooitzen Eggink has moved on from Formation Design Systems and has returned to The Netherlands to take up a new career in renewable energy.

Jordan Glanville, a recent graduate of the Australian Maritime College, has taken up a position with BMT Defence Services (Australia) in Melbourne.

Marino Gomes continues consulting as Hydranautics Australia and, in addition to providing consultancy services for clients within and without the marine industry, is also developing business software for complex problems.

Jon Gould moved on from Frontier Engineering Solutions many moons ago and, after some time at Halcyon International, has taken up a position with Crondall Energy in Perth, a company consulting to the offshore industry.

Michael Halkes has moved on from Olympic trials for the 49er skiff class, having narrowly missed out on qualification, and has taken up a position running the media company diyi.com Ltd in Hong Kong; friends can check it out at www.diyi.com.

Steve Harler has moved on within the Seatrac organisation, which itself has moved on to become Well Ops SEA in Fremantle, and Steve has taken up the position of Engineering Manager. The company specialises in subsea well-intervention work, using vessels in place of conventional drilling rigs.

Peter Hatton has moved on from One2three Naval Architects and has taken up a position as a trainee surveyor with Lloyd's Register Asia in their Melbourne Port office.

John Hayes has moved on from the Department of Planning and Infrastructure in WA and has taken up a position as a naval architect/design engineer with Dof Subsea in Perth, a company which does ROV and dive work, and provides assistance with subsea assembly and survey.

Peter Henry has moved on from the Centre for Maritime Engineering, Defence Materiel Orgsanisation in Sydney, and has taken up a position as a naval architect with the Directorate of Navy Platform Systems, Navy Systems Command, in Canberra.

Danielle Hodge has moved on within the Defence Materiel Organisation and has taken up a position with Amphibious Deployment and Sustainment Projects (the LHD acquisition project) in Canberra.

Zoran Jaksic has moved on from Thales Australia and has taken up a position as a naval architect with Burness Corlett Threee Quays Australia in Sydney.

Colin Johnson moved on from Alloy Yachts International in NZ some moons ago and took up a position with Gibbs & Cox Australia. He has now moved on from there and has taken up a position with Tenix Marine in Williamstown.

Simon Kelly moved on from Logistic Technologies International many moons ago and took up a position with Tenix Marine in Williamstown. He has now moved on within the Tenix organisation, and has taken up the position of Senior Naval Architect on the LHD project, based in Ferrol in Spain for two years.

Nick Kitching, a student at the University of New South Wales, has taken up a part-time position with Spear Greeen Design in Sydney while he completes the requirements for his degree.

Mark Korsten has moved on from his Defence Strategic and International Policy Division posting in Tonga, and has taken up a position with Boartes, professional management consultants, in Doha, Qatar. He has also set up his own consultancy, Pacific Operations, providing consulting services for operational activities in the Pacific such as fisheries surveillance, law enforcement, natural disasters, etc.

Greg Laanemaa, a student at the University of New South Wales, has taken up a part-time position with EMP Composites in Sydney while he completes the requirements for his degree.

John Lembke moved on from Frontier Engineering Solutions many moons ago, and has taken up a position with Halcyon International in Cottesloe, WA.

Chris Malthouse has moved on from Tenix Marine and has returned to the UK to take up a position with the Ministry of Defence.

Andrew McNeill has moved on from Jacobs Australia and has taken up a position with BMT Defence Services (Australia) in Melbourne.

LEUT Katie Miller has moved on within the Royal Australian Navy, and has taken up the position of Marine Engineering Officer on submarine HMAS *Farncomb*.

Richard Milne has moved on from Thales Australia and has taken up a position as a naval architect in the Directorate of Navy Platform Systems, Department of Defence, in Canberra.

Henry Morgan, a student at the University of New South Wales, has taken up a part-time position with the NSW Maritime Authority in Sydney while he completes the requirements for his degree.

Brett Morris has moved on from the Directorate of Navy Platform Systems in Canberra and has taken up a position as a naval architect with the Maritime Platforms Division of the Defence Science and Technology Organisation in Melbourne.

Michael O'Connor moved on from the Department of Defence a couple of years ago and took up a position doing a marine engineering cadetship with ASP Ship Management, working on commercial vessels around the Australian coast. He has moved on from there and has now taken up a position with Rolls Royce, contracting to the Amphibious and Afloat Support Systems Program Office of the Department of Defence in Sydney.

Tauhid Rahman has moved on from ABS Pacific and has taken up the position of Naval Coordinator with Det Norske Veritas in Sydney.

Ian Sargeant moved on from Incat Crowther many moons ago and has now taken up a position with AMD Consulting, overseeing the construction of two AMD-designed vessels at Austal Ships in Fremantle.

Paul Steinmann moved on from Frontier Engineering Solutions many moons ago and formed his own company, Halcyon International in Cottesloe, WA, providing ship-motion-control solutions and marine design services to the industry; friends can check out the company at www.halcyon.net.au.

Tony Vine has moved on within the Royal Australian Navy and has taken up the position of Commanding Officer at Naval Headquarters Tasmania, in Hobart.

Richard Young has moved on from the Towing Tank and Model Test Basin at the Australian Maritime College where he has worked for the past 12 years, and has taken up a position as a project manager with Gradco, a civil construction company, based in Launceston.

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
Sam Tait
Martin Grimm
Gregor Macfarlane

The Spanish LHD *Juan Carlos I* after her launching at the Navantia Ferrol Shipyard on 10 March 2008
The Australian LHDs, *Canberra* and *Adelaide*, will be based on this design
(Photo Infodensa)

[**FROM THE ARCHIVES** will return in the next edition of *The ANA*]

We are where you are.

Wärtsilä is the world's leading supplier of complete ship power solutions and a major provider of turnkey solutions for distributed power generation. In addition Wärtsilä operates a successful Nordic engineering steel company. More than 10,000 service oriented people working in 50 countries help Wärtsilä provide its customers with expert local service and support, wherever they are.

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