THE AUSTRALIAN NAVAL ARCHITECT

Volume 8 Number 2
May 2004

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THE AUSTRALIAN NAVAL ARCHITECT

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(Australian Division)

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Cover Photo:

Perth, the tenth, and last, Anzac-class frigate to be built by Tenix Defence enters the water at her launching on Saturday 20 March 2004. *Ballarat*, recently handed over to the RAN, lies at the fitting out wharf nearby. (Photo John Jeremy)

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The Editor
The Australian Naval Architect
c/o RINA
PO Box No. 976
EPPING NSW 1710
AUSTRALIA
email: jcjeremy@ozemail.com.au

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on the
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From the Division President

I sit down to write this having just completed a quick trip to London for a meeting of Council, the Annual General Meeting and the Annual Dinner. The trip, which was at my expense, was to a large extent inspired by our Editor's excellent historical piece in the previous issue of the ANA.

It triggered some further research in the archives, both here in Australia and in London, conveyed in a series of emails between John Jeremy, the Chief Executive and me. The research concluded that it was the April 1954 meeting of Council in London that approved the by-laws of the (then) Australian Branch and, therefore, constituted the inauguration of the Branch. On this basis, I felt that the corresponding Council meeting this year should be marked by my presence in person, as we still feel as though we are a cohesive Division within the larger entity of RINA.

I took the opportunity to meet the Chief Executive to discuss various aspects of RINA's relationship with Engineers Australia, whose President and Chief Executive had visited RINA Headquarters the previous week. The main topic of these discussions was "chartered" status, which is clearly an important matter for members of the Division and will require more work by the Division Council, the Joint Board and the Chief Executive in order to reach a satisfactory conclusion. The timing of my visit, within a week of the London discussions and within four months of the Chief Executive's discussions with Engineers Australia in Canberra, could not have been better.

Attending the Council in person for the first time also served to illustrate how, despite the intervening 50 years, we as a Division bring to the Institution a distinctly Australian "can do" characteristic which is not necessarily bridled by history to a similar extent as our parent body. From an Australian perspective, the main item of business was the approval of a letter from the President to the Division, congratulating us on our 50th anniversary. As you might note from the text of the letter (reproduced in this edition), the history of Australian victories on the cricket field is felt deeply in London! Our participation in Council is whole-hearted, though in a cooperative rather than combative manner.

RINA has continued to evolve with amendments to the membership rules over the years, as illustrated by the approval of Corporate Partner membership at this Council meeting. I would expect that some companies and other organisations within Australia will see benefit in associating with RINA by becoming Corporate Partners.

As many of you will know, Bryan Chapman, Noel Riley and I as the three Australian representatives on Council, normally participate in Council meetings by teleconference. The usual difficulties of teleconferencing are compounded by the inconveniences of timing and the fact that we are voices at the end of phone lines, whereas the remainder of Council has the benefit of face-to-face contact in London. Despite the technology, the tyranny of distance is not yet slain as evidenced by a telephone fault in the vicinity of the RINA building that prevented Bryan's and Noel's teleconference participation on this occasion. My presence not only allowed me to continue our representation in these circumstances, but to get to know some of the UK-based Council members, and for them to get to know me, further enhancing the effectiveness of our representation.

A highlight of the Annual General Meeting was the presentation the Small Craft Medal to the 96 year-old Olin Stephens for his lifetime contribution to yacht design. Medals were also presented to authors from Korea and Southampton for papers published during 2003 — it has been several years since an Australian won one of these awards and it is something that our Division's members should aspire towards.

The Annual Dinner rounded off a very full day. In recognition of our 50th anniversary I was honored to be seated at the top table with "the great and the good" and subjected to the occasional reference in the speeches to an Australian presence — relatively painless but most enjoyable. Then it was time to start the trek home.

To sum up, I think the trip was most worthwhile in reinforcing communications with Headquarters and with other Council members in particular. However, it also served to demonstrate that we in Australia have a substantially different perspective on our professional interests from our antipodean brethren, and that our Division Council has an important role in developing and putting forward that perspective to London.

Finally, would I make the trip again just for this one day of meetings? Well it's a hypothetical question as we won't be celebrating a major milestone again for at least another 25 years, but I take my hat off to Noel Riley for having such passion for our profession's future to have made the trip several times for the sole purpose of attending Council in person.

Rob Gehling

Editorial

I sometimes feel that the Australian press has an aversion to good news. I would have thought that the selection after international competition of an Australian shipbuilder (Tenix) by the New Zealand government as the preferred tenderer to supply no less than seven ships for the RNZN would have rated page-one reports, or at least a few column centimetres on page two. Perhaps I simply missed them.

A major order for a publicly-listed company like Austal will usually be reported in a paragraph on the financial pages, but it should not be surprising if many Australians still believe that our foreign income is principally earned by wool, wheat, coal and iron ore. Whilst primary and resource industries account for a major portion of our national income, manufacturing-industry exports make a very significant contribution. Our shipbuilders are active exporters, as all naval architects know. Thirty years ago a shipbuilding industry substantially focused on the exports rather than the local market was a dream. Today it is a reality.

Despite the apparent preference of the Australian media for doom, gloom and scandal, *The Australian Naval Architect* editorial team will always prefer the good news over the bad.

John Jeremy

FROM THE RINA PRESIDENT

To mark the fiftieth anniversary of the formation of the first Branch of the RINA, the Australian Branch, the President has written to the President of the Australian Division, members of Council and all members of the Australian Division.

Dear President,

The Australian Division — 50 (Years) Not Out!

It is with great pleasure that I write on behalf of the Council and members of the Institution to congratulate the Australian Division on achieving its 'half century'.

Founded in 1954 as the Australian Branch, becoming the Australian Division in 1979, the Division has the distinction of being the first overseas Branch of the Institution and the largest grouping of members outside the UK.

During its 50 years 'at the crease', the Australian Division has made a significant contribution to the work of the Institution and its standing in the international maritime industry. It has helped the Institution to achieve its objective of 'promoting and facilitating the exchange of scientific and technical information, views and discussion' through the many papers published by members of the Division in the Transactions or presented at conferences and technical meetings over the past 50 years. This work is exemplified by the very successful international Pacific Conferences organised in recent years by the Division.

Tribute must also be paid to the particular contribution made by individual members of the Australian Division who have given freely and willingly of their time to serve on the Divisional Council and Section Committees. The value of that contribution over the past 50 years cannot be overstated.

I believe that the founding members of the Australia Division who first met in Sue's Café and determined that an association of naval architects in Australia should be formed would be proud of their legacy. I wish the Australian Division and its members every success in the future, knowing that whatever that future may bring, the Division and its members will continue to be an important and valued part of the Institution.

Yours sincerely
W G Price
President

Letters to the Editor

Dear Sir,

Previous correspondents have discussed the use of U-tubes for measuring heel and/or trim (*The ANA*, February 2001, May 2001 and November 2001), and some discussion of this arose over coffee one morning at Pacific 2004. My opinion is that, provided that the two end heights are measured simultaneously, expansion of the tube and/or liquid does not matter, the correct angle will result.

My experience with U-tubes is limited to an experiment during the inclining of *John Monash* in Woolwich Dock in 1968. For that experiment, I used a pendulum damped in water and a 12 mm transparent polythene U-tube filled with water. At first, the results from the U-tube were confusing, but once it was clear that the level in the tube was dropping and that it was imperative to record the level in both arms for each movement of inclining masses, then very good agreement between the pendulum and U-tube were obtained.

With the U-tube rigged through the middle of the day, I observed that the water level was dropping of the order of one inch (25 mm) per hour due to evaporation. It seems to me that if this is taken into account by comparing the change in slope of the deck as measured by simultaneous readings at each arm of the U-tube, accurate and reliable results should be obtained.

There are a number of factors that would affect water level in a U-tube, e.g. change in water density with temperature. I remember setting up the U-tube on the office roof after the inclining and found that the liquid level just kept falling. I think evaporation has a contribution. The point is that there is an appreciable drop in water level over the time it takes to do an inclining experiment. The rate of drop may change with the tube material but is likely to always exist. A measurement technique should therefore be used that takes that possibility out of the equation.

The potential advantages of a U-tube in measuring change in heel are that the baseline length of the instrument can generally be longer than for a pendulum, and the swing movement of the water level in the U-tube during a reading is much smaller than that for a pendulum. To my way of thinking, this could allow the use of smaller inclining weights since the inaccuracy in reading would be reduced. This may have benefit in allowing a large boat or small ship to be inclined in a quiet area, streaming from a buoy away from cranage.

Another interesting comparison was made within the last five years while preparing to incline HMAS *Westralia* at HMAS *Stirling* in WA. The weather had been consistently marginal, day and night, resulting in a decision to switch from water-damped to oil-damped pendulums. A new oil-damped pendulum was rigged in the engine room without removing the water-damped one. These pendulums were of the order of 11 m in length and, while the wind was still up, a comparison of pendulum swings could be seen. Not surprisingly, the oil-damped pendulum had a much smaller swing than the water-damped one. What did cause a little discussion was that the pendulums were swinging about 90 degrees out of phase. That raised the question of whether the transverse dynamic effects of the pendulum securing

points might be different. Unfortunately, we were too busy with ship checks at the time to take any comparative readings, and we didn't have the personnel available later during the actual inclining after the wind had dropped. I've only seen perfectly-still pendulums on four or five inclinings in 30 or 40, so I can see that there may be some very small error in the traditional methods anyway.

We intend to experiment again with U-tubes, but would welcome advice of any other experiences. The minimum diameter of the U-tube is an obvious question, but there are many others. Ideally, when the theories are being tested it would be nice to test the limits of water-damped pendulums, oil-damped pendulums and U-tubes against an electronic level that can show statistical results of heel angle.

Richard Caldwell

Dear Sir,

With reference to the continuing discussion on the use of U-tubes for measuring heel or trim, I don't believe that evaporation can possibly be an issue. The surface area is just far too small. The issue, I think, is one of the expansion of the tube, which I suspect is caused by two factors, one being the thermal expansion and the other being the creep of the plastic with a load applied.

I recall that my previous letter was suggesting that we would do an inclining with a steel tube to avoid both of these issues. Unfortunately the opportunity to do this has not yet arisen.

I agree that if *both* sides of the U-tube are read simultaneously then there should be no problem. I cannot see that friction within the tube is an issue, as water is essentially incompressible; as long as the gross motion of the contents is not still rising/falling owing to the movement of the inclining masses.

I always record the pendulum swing or U-tube movement against time, on a piece of paper behind the apparatus, and then eyeball a central point on the record, over about two or three minutes. This way there is a record of exactly where the level was at any point of time and also the range of motion. It is surprisingly accurate.

U-tubes may well be banned by the USL Code and Marine Orders for inclinings, but almost every shipyard/boatyard on earth uses them to set up levels during construction. Certainly every shipyard that I have worked for has used this basic technique on a routine basis, and the accuracy of lining up bits of ships must be every bit as demanding as measuring heel in inclining experiments. I accept that lasers and dumpy levels exist; in a shipyard environment they break, whereas plastic U-tubes are indestructible.

Tony Armstrong

Dear Sir,

My introduction to the vagaries of U-tubes was through my Physics 1 lecturer at Queensland University in 1941. She referred to the principal cause of inconsistencies as "stiction", which I interpreted as another name for friction. As I recall (60 years on), her remedy was to jiggle the tubes up and down to achieve consistent readings, i.e. the rise in level on one side equalled the fall in level on the other.

When U-tubes began to be used by shipyards in Australia to record heel during inclining experiments, this same inconsistency appeared. It was not practicable to determine which reading was the more reliable, or if neither was. I don't see that simultaneous readings will solve this problem.

In consequence, it was decided not to accept U-tube readings but to rely on pendulum readings with all their well-known idiosyncracies. The problem was highlighted by the case of the inclining of one large vessel, where the *only* measurements of heel were obtained from a single U-tube on one side of the ship connected to a "black box"-type reservoir on the other. The only measurements were of the rise and fall of the level of liquid in the one tube.

Tony Armstrong suggests that U-tubes are in general use in ship and boat yards for setting up berths. In my experience, light beams and/or taut piano wire have been in more general use. I consulted that fount of knowledge, Campbell Holms' *Practical Shipbuilding*, and a quick search revealed piano wire but no U-tubes.

The experiences of Richard Caldwell and Tony Armstrong seem to support the view that U-tubes have significant drawbacks. To all the possible sources of error mentioned, perhaps osmosis could be added, particularly in relation to softer or more porous materials.

For those interested, the following are some of the references available on heel measurement and inclining experiments in general.

U-tubes

IMO Resolution A.749(18) Code on Intact Stability for all Types of Ships Covered by IMO instruments, as amended by Resolution MSC 75(69) and adopted 14 May 1998; see Annex 1, Paragraph 2.5 (note the reservation expressed in 2.4.7).

Inclinometers

Corlett E.C.B., A Highly Damped Inclinometer for Inclining Tests, *Trans. RINA*, 1948, v.90, p.64.

Semyonov-Tyan-Shansky, V., *Statics and Dynamics of the Ship*, Peace Publishers, Moscow, p.576, 2 (Amayev's Inclinograph).

Benson F.W., Sensitive Clinometer and Level, *Trans. NECIES*, 1944–45, v.61, pp.137–140, d.89-92.

Inclining Experiment Theory and Practice

Robb A.M., *Theory of Naval Architecture*, Charles Griffin & Co Ltd, London, 1952.

Semyonov-Tyan-Shansky, V. *Statics and Dynamics of the Ship*, Peace Publishers, Moscow, p.567.

Rossell and Chapman, *Principles of Naval Architecture*, v.1, p.128, SNAME, New York, 1942

Wood-Norris, L., Inclining Experiment Uncertainty Analysis, *Proc. Society of Allied Weight Engineers*, San Diego, May 1977.

Shakshober, M.C. and Montgomery, J.B., *Analysis of the Inclining Experiment*, SNAME, Hampton Roads Section, 2 February 1967 [*This is a must-read for every naval architect who supervises an inclining experiment* — Ed.]

Cornell, R.L., Rethinking the Inclining Experiment, *Ocean Industry*, May 1983, p.27.

Wright, C.L., *The Significance of Metacentric Heigh*t, SNAME, New England Section, 10 January 1969.

Scribanti, A., On the Heeling and Rolling of Ships of Small Initial Stability, *Trans. RINA*, 1904, v.46, p.93.

Hovgaard, W., Inclining Experiments on Ships of Small or Negative Stability, *Trans. RINA*, 1926, v.68, p.221.

Straubinger, E.K. and Kern, P.H., A Statistical Examination of Weight and KG Margin Values for US Navy Surface Ships, *Proc. Society of Allied Weight Engineers*, San Diego, May 1977.

Tawresey, J.G., The Inclining Experiment, *Trans. SNAME*, 1928, v.36, p.103.

Lewis, E.V., Precision in Naval Architectural Calculations, *Trans. SNAME*, 1941, v.49.

Robert Herd

Readers will be pleased to know that, prompted by the recent discussions, an undergraduate thesis topic is now under way by UNSW student Sean Cribb to investigate the use of U-tubes for measurement of heel in inclining experiments. He has already found, via the Internet, that IMO, IACS and the Norwegian Maritime Directorate all permit the use of U-tubes and have requirements for the arrangements. Watch this space — Ed.

Dear Sir,

I am currently studying for my BE degree in naval architecture at UNSW. Graduation is fast approaching to end my student days, and I think that the industry lacks temptation for future young graduates, like myself. For example, the concept of flying cars in the future fuels the recruitment of people into the automotive industry. What holds for naval architects? The design and preservation of aged ships? No! I envisage amphibious vehicles to be the everyday mode of transport of the future. Monday-morning traffic on the harbour bridge? Forget that! Go, go, gadget propellers! For people to have the concept that they can either choose to drive to work by means of land or water in the same vehicle is desirable, and will evolve the naval architecture fashion.

The point I make is that the "lure of the sea" alone no longer tempts young people in sufficient numbers. I challenge the industry to explore revolutionary avenues where the skills of a naval architect may be diversified. The concept of people using amphibious vehicles as a common mode of transport may sound as ridiculous as monkeys on roller skates, but it could just be what the profession needs.

Ramesh Watson
UNSW Student

Dear Sir,

I am from Malaysia, and currently studying in the naval architecture plan at The University of New South Wales. Japan is another country which came into my mind when I was deciding which university I should go to. After considering several factors such as language, living cost, and program offered, I decided to come to UNSW.

Not many universities offer a naval architecture program. Australians are lucky to have two educational institutions, UNSW and AMC, providing this plan. I had little idea of what naval architecture was all about before I began my third year of study. However, I really enjoy studying this course as it is challenging and interesting. Several visits to shipyards, consulting firms, and ships have really inspired me to explore more in this area.

There have been a few maritime incidents in Malaysia during the last twenty years, and some of those caused severe loss of money, and even lives. I have read a lot of articles about those incidents and it seems to me that most of them were caused by poor design or individual mistakes. I read more articles about maritime accidents around the world recently and realized how important a good and safe design is. I feel great while studying in UNSW as I am getting more and more knowledge of ship design. I am also delighted with the easy access to various naval architecture journals and data in Australia.

I am impressed by the popularity of ships and yachts in Australia. Like the America's Cup, the annual Sydney-to-Hobart yacht race is a really good event to raise public awareness of the naval architecture industry. These kinds of events rarely occur in Asian countries. This may be the reason why there are so few Asians (except Japanese and Korean) in this industry.

Overseas students always face problems such as language and culture differences, and so do I. However, I have no regrets in choosing the naval architecture plan at UNSW and I am really enjoying it.

Joon Chee Yew
UNSW Student

THE AUSTRALIAN NAVAL ARCHITECT

Contributions from RINA members for *The Australian Naval Architect* are most welcome. Material can be sent by email or hard copy. Contributions sent by email can be in any common word processor format, but please use a minimum of formatting — it all has to be removed or simplified before layout. Many people use Microsoft Word, but illustrations should not be incorporated in the document. Photographs and figures should be sent as separate files with a minimum resolution of 150 dpi. A resolution of 200–300 dpi is preferred.

NEWS FROM THE SECTIONS

New South Wales

Committee Meetings

The NSW Section Committee met on 11 March and, other than routine matters, discussed:

- SMIX Bash: *James Craig* has been booked for 2004; credit-card facilities will be available for bookings this year; ticketing to have an "early-bird" pricing to encourage early bookings; publicity and sponsorship were discussed at length.
- Technical Meeting Program: All RINA presentations are now signed up for this year (see *Coming Events* in this issue), with several possibilities in the queue; letters of invitation and thanks to be sent to each presenter.
- The Walter Atkinson Award for 2003: Nominations due from members to the Committee by 16 April, with our nomination due to the Australian Division by 31 May.
- Finance: $914 at the bank on 29 February, with all SMIX Bash 2003 payments and receipts having now been made; bridging finance for SMIX Bash a recurring problem and possible solutions canvassed.
- Fees Amnesty: It was suggested that, in view of the current fees amnesty, the Australian Division should request that London contact all lapsed members at their last-known address to make them aware of the offer.

The NSW Section Committee also met on 28 April and, other than routine matters, discussed:

- SMIX Bash: Wartsila Australia to remain as principal sponsor; *Red Ensign* (journal of the Merchant Navy Association) will advertise the Bash and *Signals* may also; SMIX Bash Committee to meet.
- Technical Meeting Program: Details confirmed for this year; letters of invitation and thanks under way.
- The Walter Atkinson Award for 2003: List of contenders being compiled, and includes papers published in *The ANA;* our nomination due to the Australian Division by 31 May.
- Fisher Maritime Presentations: NSW and WA to advertise via their email lists, and AD to advertise in *The ANA.*
- Finance: Little change since last month; bridging finance for SMIX Bash discussed further — NSW to create a separate social account.
- Committee Membership: Todd Maybury, a member of the foundation Committee of the NSW Section and Assistant Secretary for the last two years, has tendered his resignation from the Committee; many thanks for your effort, Todd! If you are interested in joining the Committee, then please contact one of the members (see below).

Annual General Meeting

The NSW Section held its sixth AGM on the evening of 23 March, following the March technical presentation and the Australian Division AGM at Engineers Australia, Milsons Point, attended by sixteen with Phil Helmore in the chair.

Phil, in presenting the Section's Annual Report, touched on some of the highlights of 2001, which included ten joint technical meetings with the IMarEST (Sydney Branch), with attendances varying between fifty four (Bruce McRae's presentation on *Design of Offshore Yachts for the New Millennium*) and fifteen, and the fourth successful SMIX Bash in December 2003 which was attended by 140, despite the preceding downpour. RINA had a stand at Pacific 2004 which was crewed continuously by Section Committee members. RINA divisions, branches and sections now have short-form addressing of their websites due to a request from the NSW Section.

Adrian Broadbent presented the Section's Financial Report. The Engineers Australia venue at Milsons Point had, as usual, been our major cost for the year. However, with a close watch on the outgoings, we had managed to operate within the black all year and had $1100 at the bank on 31 January 2004. SMIX Bash, whose funding is entirely separate from Section finances, for the second time made a small profit which was shared by IMarEST (Sydney Branch) and RINA (NSW Section).

All committee members were thanked by the Chair for their contributions, some for a number of years. All have signified their willingness to continue in their current positions, obviating the need for elections this year. As a result, the committee for the coming year remains as follows:

Chair	Phil Helmore
Deputy Chair	Graham Taylor
Treasurer	Adrian Broadbent
Secretary	Lina Diaz
Assistant Secretary	Todd Maybury (resigned 28 April)
AD Council Nominee	Martin Williams
Members	Craig Boulton
	Don Gillies
	Bruce McRae
	Grahame Parker
	Andrew Tuite

The Bay-class Patrol Boats

Greg Hellessey of the Australian Customs Service gave a presentation on *The Operation, Crewing and Maintenance of the Australian Customs Service Bay-class Patrol Boats* to a joint meeting with the IMarEST attended by thirty-five on 11 February in the Harricks Auditorium at Engineers Australia, Milsons Point.

Introduction

Greg began his presentation with some background information on the operations of the Australian Customs Service. The service comes under the Justice and Customs portfolio of the Federal Attorney-General's department. The responsible minister is the Hon. Chris Ellison, a senator from WA, and the CEO is Mr Lionel Woodward. Customs is the second-largest revenue earner for the Federal Government (trailing only the Australian Tax Office), generating about $10 billion per year. They have an operating budget of less

than one-tenth of that, a staff of 4 600 in Australia and overseas, and are world leaders in customs administration. Their objective is to prevent illegal movements of people and goods across Australia's borders. To achieve that objective, they work closely with other government and international agencies, in particular the police, quarantine, and immigration operations.

The National Marine Unit

Part of the operation is marine and has evolved from a disparate group of vessels and seafarers run on insular regional lines, into a national operation run by the National Marine Unit (formed in 1995) which is centrally managed in Canberra. The unit has a staff of 245, of which 168 are seagoing positions. The ACS upgraded their fleet of vessels recently, and now provide their services with eight Bay-class patrol vessels: *Arnhem Bay, Botany Bay, Corio Bay, Hervey Bay, Holdfast Bay, Roebuck Bay, Storm Bay and Dame Roma Mitchell*. These vessels were built by Austal Ships in Fremantle, and their principal particulars are:

Length OA	38.2 m
Beam	7.2 m
Draft	2.1 m
Displacement	134 t at full load
Engines	2 x MTU 16V 2000 M70 1050 kW @ 2100 rpm
Gearboxes	2 X Reintjes WVS 430/1 RR 2.565:1
Propellers	2 x Veemstar 4 blade 1150 mm diameter

Endurance is as follows:

Speed kn	5	10	15	20	25
Range n mile	2000	2700	1500	1000	650

Each of the above ranges is with a 25% fuel reserve, to enable a further rapid-response EEZ voyage before refuelling is completed; note the maximum range at 10 kn. All operations are expected to be carried out in up to Sea State 5.

Greg showed slides of the major compartments in the vessels. On the bridge, there is no conventional steering wheel, but a joystick on the armrest of the watchkeeper's chair. There are displays for electronic charts, 3 cm navigation and 10 cm search radars, dunking sonar, echo sounder, autopilot, DGPS, etc. There is a small ship's office behind the bridge, and the door has recently been moved (to improve functionality of the space), and here there are three monitors for the computer, radar and chart display, and weather display. The six cabins are twin berth, small but functional and with shared ablution space, and there are four semi-permanent berths. The galley contains all commercial stainless-steel equipment and can cater for up to 16 (more in an emergency).

The engine room is surprisingly light and airy. There is a soft hatch in the deckhead, and this is a good feature as it simplifies repair operations. It takes 4 h to remove a main engine, and 6 h to replace, or 10 h to realign a gearbox. The steering flat is the nerve centre for the ride-control system, the steering gear and the cross-connection of the twin rudders.

Each vessel has two tenders, based on the Wiltrading Pursuit 640 but modified for specific requirements. The tenders have a length of 6.40 m, beam 2.2 m and draft of 0.425 m and are powered by twin Yamaha 67 kW outboards giving a pursuit speed of over 35 kn. The tenders deliver enforcement personnel onto other marine assets, e.g. illegal fishing vessels and drug or immigration suspects.

The vessels are sisters, not octuplets and, like most sisters, they vary.

Operations

Under international legislation, Australia has an Exclusive Economic Zone which lays claim to an area 200 n miles off the Australian coast, giving a patrol area of approximately 10 million km^2. However, there are areas where Australia has rights to the sea bed (for example, the Tasman Rise), but not to the water column above it! This means that we have rights to about 16 million km^2 of sea bed, but 10 million km^2 of water column. Heard and Macquarie Islands are approximately 4000 n miles from Perth, and 1500 n miles from Antarctica, so we have a lot of territory to patrol.

Illegal fishing has been in the spotlight several times recently, with well-publicised chases. Customs sees many illegal fishing vessels, and these are often prosecuted on behalf of AFMA (the Australian Fisheries Management Authority). The two usual types of offences are fishing outside of the allowed zone (i.e. in illegal areas), or taking things from the water which they are not supposed to take (i.e. illegal catches).

Drugs are another major item for prosecution on the marine agenda, as much of the illicit traffic enters Australia by some form of sea transport. Customs has been involved in a number of detections and seizures of large quantities of illicit drugs; for example:

Date	Amount kg	Type	Value $million	No. of Arrests
April 2003	125	Heroin	125	34
July 2002	1117	Cocaine	500	5
July 2001	300	Amphetamines	unknown	unknown

If all entries the *Value* column (including seizures not shown here) is totalled, then the vessels have already paid for themselves at least forty times over.

Crewing

The Bay-class patrol boats have a nominal crew of eight, but this can be varied, depending on the requirements of a particular operation. There are 168 approved crew positions, and these provide the crews for the vessels deployed around the Australian coast. The vessels are not home-ported, and the crews join/leave the vessel, wherever duty has called, on a fly-in/fly-out basis. Crews work on a 42-day roster, with 22 days rostered on and 20 rostered off. Crews can generally live in their own preferred location, but subject to some restrictions due to the need to deploy vessels at short notice.

Maintenance

Each vessel is expected to undertake 16 patrols per year, with 18 sea days in each patrol, giving almost 300 sea days per year for each vessel; this compares most favourably with the 160 d/a from the previous class of customs vessels. There are three days between patrols to allow for crew change and

maintenance, with one longer 28-day major maintenance and annual survey period.

Maintenance for the Bay-class vessels is provided by a combination of in-house and outsourced effort. At sea, there is only one technical person, the engineer, and he/she does everything, from planned maintenance to coping with breakdowns. Alongside, the maintenance is a combined effort, with the maintenance service contractor (a consortium of Austal Ships and Adsteam Offshore) taking on the bulk of the items.

An interesting problem occurred with the aftmost shaft bearings. On these vessels, each shaft has an aft bearing mounted on the rudder horn behind the propeller. The bearing material is a type of plastic, and lubricated by sea water flowing through longitudinal grooves in the bearing alongside the shaft. The bearings were failing in service. Some detective work plotted the failures against time in service, and showed that the failures were occurring at about 12 and 24 months of service life. The bearing material was investigated, and it was found that when it started to go, the bearing material deformed into the waterways, restricting the water flow and spiralling quickly to failure. The problem was solved by increasing the clearance of the bearing on the shaft by 2 mm, thereby increasing the water flow and decreasing the friction and, hence, the likelihood of failure.

Questions

Question time was lively, lasting for more than half an hour and eliciting further interesting points. For example, the vessels have no fixed weapons to fire warning shots across bows. The crew have access to Glock pistols, a shotgun and an M16 rifle if necessary for protection or apprehension.

"Patrol vessel" is, perhaps, not an apt description. Rather, with such an enormous area to cover, the "patrol" is carried out by aircraft from Customs' Coastwatch Branch, and they request the boats to investigate sightings or incidents.

The vessels have a nominal working life of ten years, which is already half over for the first-of-class, *Roebuck Bay*. We therefore need to be thinking about replacements soon! The procurement process for the Bay-class vessels has generally been successful, and the same process may well be followed for the next vessels. However, the size of the replacement vessels will be determined by what the Government sees as the task for the years ahead, and this may well have changed for the future. A small increase in length, for example, would mean an immediate increase in the crewing level required.

Fatigue in the aluminium hull and superstructure has not been a problem so far. There have been cracks, mainly in the fan plenums for the engine-room air intakes, but this is in way of the major change of section at the aft end of the house, and is though to be due to stress concentration rather than fatigue.

The vessels are fuel-efficient, with results from the towing-tank tests at the AMC showing that these vessels have minimum resistance for their length and displacement.

The vote of thanks was proposed by Laurie Prandolini and carried with acclamation.

Advanced Composites in Ship Structures

Kevin Porter of Lloyd's Register gave a presentation on *Applications of Advanced Composites in Ship Structures* to a joint meeting with the IMarEST attended by fifty on 23 March in the Harricks Auditorium at Engineers Australia, Milsons Point. Kevin introduced the topic by saying that composite construction is not new; it has been used for hundreds of years such as hides on timber (e.g. Irish coracles and Eskimo kayaks), timber (laminated frames), timber on steel, and steel and aluminium themselves (metal-matrix composites), etc. However, modern composite engineering is a speciality field, and concentrates on non-metallic materials, principally plastics with fibre reinforcement for marine applications.

Advantages and Disadvantages

Plastics, in general, are non-corrodible, have good resistance to both acids and alkalis, and are resisant to weathering. They are light, having a relative density of 15–20% of that of steel, but do not have the rigidity of steel. The greatest problem with the use of plastics is their low resistance to fire, as they cannot sustain temperatures of more than 250°C. Flag administrations and classification societies require similar levels of fire rating, and the laminate system must be subjected to a standard fire test to demonstrate compliance. The core temperature in the resin must not exceed the heat distortion temperature, i.e. where the material loses its inherent structural integrity. The division under test must prevent the passage of smoke and flame to the end of a 60-minute fire test. The lack of the rigidity of plastics has been mentioned but, worse, some plastics are softened by exposure to grease and petroleum-based fuels. They also suffer from higher rates of creep.

MoRPH

The principal factors governing the end quality and performance of modern composites are embodied in MoRPH, an acronym coined in the 1980s for the factors in the morphing from components to composites: Materials or Resins, Process and the Human factor. Kevin then proceeded to elaborate:

Materials

Materials, in this case, refers to the fibre reinforcements used in the composite matrix. The principal ones are glass, aramid, and carbon fibres.

Glass fibres come in different types: E glass, which is the standard work-horse of the marine industry; S glass, which has high strength but low resistance to alkalis and is more expensive, and so less used; A glass, which should be avoided; and C glass, which is used in the chemical industry because of its high resistance to acids.

Aramid fibres, principally Kevlar from duPont, are used in high-performance racing craft because of their high impact strength. They have good resistance to abrasion, but the detection of cracks is difficult. Their tensile strength is great, but compression is poor, and so design is based on compression, and careful placement of fibres is required. Kevlar is hydrophyllic (i.e. absorbs water) and, prior to layup, must be kept dry and clean, and only cut when required for moulding.

Carbon fibres are becoming more common due to the lowering of production costs. However, they are still expensive, but give high performance, with carbon fibres having the highest specific stiffness. They are grouped into Type 1 (high modulus) or 2 (ultra-high modulus) in terms of strength. They have high strain rates, and so design is on the basis of strain, typically 1–1.5%. However, there is no such thing as a free lunch, and carbon composites have their disadvantages, which include lower impact strength than other composites, they are brittle, and have poor resistance to direct shear or edgewise loading. In addition, if placed in close to proximity with metals, they can set up a galvanic cell and cause corrosion problems.

Resins

There are four basic resin types: polyester, vinylester, epoxy and phenolic.

Polyester resins are subdivided into orthophthalic (cheapest of all, but have the lowest resistence to water, and Lloyd's Register do not allow next to the water) and isophthalic (which have better water resistance and are the main constituents of gelcoat resisns).

Vinylester resins are being increasingly used, and the current trend is to have no gelcoat below the waterline.

Epoxy resins are the "Rolls-Royce" of resins, consisting of a two-pack resin plus hardener. They are the most expensive, but they give the best performance.

Phenolic resins have been proposed for marine use. However, they require post-curing, and the edges are not sealed properly and this can lead to problems.

Comparing polyester and epoxy systems, the epoxy-based composites have better chemical and weather resistance properties, and can be laid up in temperatures as low as minus 10°C, whereas polyester-based composites cannot be laid up in less that 16°C. However, on the down side, epoxy resins are more expensive, they are more viscous and difficult to process, and the hardeners are dermatitic, i.e. they pose a health risk via skin problems.

Processing

Two methods are commonly used in the marine industry for processing: open moulding (including hand layup, spray layup and roller saturation), and closed moulding (vacuum bagging — also called infusion, and resin transfer moulding). Kevin then concentrated on the infusion moulding process.

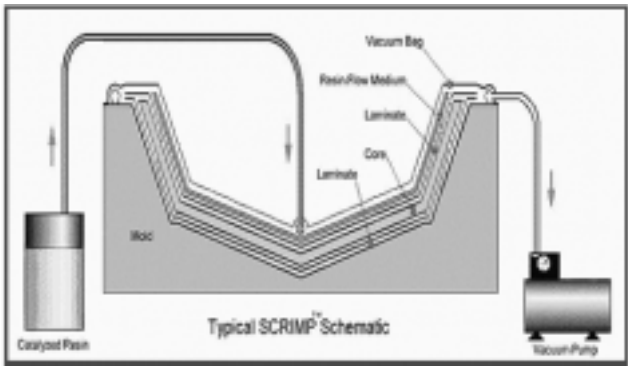
Infusion Moulding

Infusion moulding is a development in the moulding process to avoid harmful emissions to the working environment; the emissions are vacuumed into a bag. Kevin predicted that infusion moulding will take over production systems for quality laminates within the next three-to-five years, and will be used more than hand layup.

Infusion requires a very high quality mould, and it must be tested for tightness before anything goes into it. The mould itself can be ply or composite. Metals have been tried, but the welds in aluminium have been found to be porous and not tight (i.e. cannot hold a vacuum) and lead to air-bubble trails which are difficult to remove. The surface finish is extremely important, as any blemishes degrade the finish of the resin and expose the fibres.

The placement of the reinforcement is important. The warp is down the axis of the roll, and the weft left-to-right, and these must be placed correctly in the mould. Closed-cell foam must be used for the core material, and this needs deep grooving and scoring to ensure penetration of the resin to all parts of the layup.

One version of infusion moulding is the SCRIMP process: Seemann Composites Resin Infusion Molding Process. Bill Seemann, who invented the SCRIMP™ process in the late 80s, now owns the patents. The process is shown in the accompanying diagram.



Seemann Composites Resin Infusion Moulding Process (SCRIMP)
(Diagram from TPI Website www.tpicomp.com)

In this process the fibres are laid in the mould, and then the resin is admitted and drawn through with a vacuum. The fibres are held in place in the mould against the flow of the incoming resin using a spray adhesive (available in most artists' supply shops) as a tack-off agent. However, it is important not to use too much, as the hydrocarbons in the spray can affect the laminate, and these must be allowed to dissipate before closing the mould.

The infusion process requires the correct selection of resin, having suitable flow properties and low viscosity. A knowledge of flow dynamics is required, so that supply points and vacuum lines can be sited to ensure that resin reaches all parts of the mould. There must be careful planning of the process, and good quality assurance/quality control. If it is not right the first time, then a lot of money is wasted on a worthless shell.

Infusion-moulded Damage Repair

The big question for infusion-moulded vessels is "how do you repair any damage?" Infusion-moulding gives a 70% fibre fraction, which is very high, and together with the high-quality laminate, accounts for their high strength. Chopped-strand-mat moulding, on the other hand, gives a 30% fibre fraction. This means that impact damage to an infusion-moulded layup cannot be repaired to equivalent strength using CSM and hand layup to the original thickness. Bond-line adhesion becomes a problem (i.e. the discontinuity at the damage field), and overlapping must be used to compensate. Infusion cannot be used for the repair, so how do you do it? This question has not been satisfactorily answered.

Human Factors

The success of the combination of the above factors to form a high-performance composite also depends largely on human factors. The people involved must be experienced, so that they choose the correct resins, the correct fibres for the particular job, and are able to carefully plan the whole process. This is especially so for the infusion process, where a resin with low viscosity is required, the siting of nozzles is important, and a knowledge of flow dynamics is essential. Human error here can be very costly, as infusion moulding is a one-shot process and, if you don't get it exactly right, the result is worthless.

Questions

Question time brought out a number of further points, including the fact that a SCRIMP licence costs of the order of $25 000 US! Some of the problems with high-tech composites have been kept very quiet by those involved for commercial reasons. Despite that, there are significant performance gains to be made when they are used with high quality control.

The vote of thanks was proposed by Graham Taylor.

A Crankshaft Repair

Richard Hudson, consultant, gave a presentation on *The Re-alignment Afloat of a Ship's Main Engine Crankshaft using Liquid Nitrogen* to a joint meeting with the IMarEST attended by eighteen on 7 April in the Harricks Auditorium at Engineers Australia, Milsons Point.

Introduction

Richard began his presentation by saying that the failure in service of the main-engine crankshaft on a large cargo vessel is an operational disaster. Auxiliary engines can be removed via holes cut in the ship's deck, side or bottom. This can't be done for the main engine, however, as there is usually accommodation directly over, insufficient room under, and too large a hole required sideways.

Richard was Chief Engineer and Technical Superintendent for Jardine Matheson's Indo-Chinese Steam Navigation Company. One of their cargo vessels was *Eastern Rover*, built by Joseph Thompson and Sons, of length 180 ft (54.86 m), beam 57 ft (17.37 m) and depth 25 ft 3 in (7.70 m), deadweight 6592 tons (6697 tonnes) on a maximum draft of 23 ft 4.5 in (7.12 m), and having a Doxford 67LBD4 main engine delivering 4600 BHP (3430 kW). In July 1968 she arrived at Moji, Japan, at about 8 pm, too late for quarantine authorities to clear the ship and she anchored in the roads for the night. At 2100 they received radio instructions for an 0630 movement to the cargo wharf next morning. During the night, circulating main engine cooling water leaked into the No. 4 cylinder. When turning the engine over to start the next morning, the hydraulic shock caused by compression of the opposing pistons on the water in the cylinder caused a section of the crankshaft to slip out of alignment with its shrink fit on the journal, rendering the engine useless. This was a major disaster, as the vessel at the time was carrying peanut oil, palm oil and latex, and latex has a limited life and cannot be allowed to sit!

The Doxford Engine

The Doxford 67LBD4 engine was a good, reliable engine. It was the reciprocating (lever-driven) scavenge-pump, opposed-piston version having no tie rods, and there were about 1500 of them afloat at the time. It had a fully-welded entablature, with the lower piston cooled by oil, and the upper piston cooled by fresh water from the entablature. It had a common-rail fuel system via an accumulator to remove fuel pulses to the fuel valves. The main bearings were located either side of the three crank throws for the two upper-piston journals and the central, lower-piston journal. The crankshaft itself was assembled from separately-forged webs, crankpins and main journals. The crankpins and journals were machined, and the webs bored smaller, heated, and then shrunk onto the crankpins and journals. The shrinkage allowance was, and is still today, about 1:500 to 1:600 on the diameter. The grip is sufficient to prevent slipping in normal operation of the engine. The full power of the engine is transmitted through the shrunk connection of the last crank web. Keyways are not allowed in crankshafts, as they cause unacceptable stress concentrations. When the shaft has been built and tested, the classification society surveyor puts a fine chisel line on the mating faces of each web and journal to indicate the alignment, together with his personal stamp.

Cause

The cause of the damage was immediately apparent to the ship's engineers, and Hong Kong head office was notified immediately. There are two fuel valves in each cylinder, one on each side, both cooled by fresh water which also circulates to the cylinder liners and top pistons. The two possible sources of water ingress into the cylinders were the mating surfaces of the valve with the cylinder liner, or cracks in the liner itself. Subsequent inspection showed the presence of small cracks in the liner in way of the fuel valves, and these cracks had admitted the cooling water to the No. 4 cylinder. The next morning, starting air at 600 psi (4134 kPa) had been admitted to another cylinder to turn the engine over, and the top and bottom pistons in No. 4 cylinder, at the top of the compression stroke, suffered hydraulic shock, and rotated the crankshaft web relative to the journal on one of the side throws by 9.5 mm. Before rotation stopped, this mis-alignment of the crankshaft wiped the crankshaft journals of white metal on either side of No.4 cylinder, without damaging the crankshaft itself.

The Repair

When Richard arrived at the vessel, much of the engine had been dismantled in readiness for repairs and a full inspection of engine parts which might also have suffered damage. However, during the dismantling, the connecting rods for the top piston on No. 4 cylinder had been disconnected on the starboard side (only) and then the engine turned over, breaking the bottle guide on the port side! The ship did not carry a spare, and there was none to be had in Japan, and size and weight would pose problems for airfreight from the UK. This was a major additional setback as, without the guide (even with the crankshaft repaired) the engine could not operate.

Being without propulsion, arrangements were made to tow the ship from its anchorage to a wharf in Moji to facilitate repairs.

Re-aligning of the crankshaft proved very demanding. Heating with torches was not considered, as this could not be fully controlled using large torches in the crankcase, it changes the grain structure of the metal, and would not be approved by the classification society. Richard remembered that he had heard of liquid nitrogen being used on a small car engine in Europe, and decided to try the method here. Liquid nitrogen boils at –196°C to become a gas, and dry ice sublimates at –78°C. Nitrogen is heavier than air, so they would have to have full circulation of air by opening the crankcase doors and have the engine-room fans operating.

To set up for the repairs, brackets were fabricated and welded to the engine bed plates port and starboard as seats for the 50 ton (500 kN) hydraulic jacks. Two jacks were used, so that the movement could be controlled, and so that the web could be re-positioned if it went too far. A split tank was fabricated from sheet-metal to go around the journal and hold dry ice for pre-cooling all the parts associated with the crankpin. The main bearing was removed and replaced by a support with a copper liner. A bridge was placed across the engine beds to provide support for the crank throw. This was held, so that the only thing that could then move was the web in relation to the crankpin.

While set-up for re-alignment was proceeding, the bottle guide was removed from the engine and taken off via the main engine casing. No major shipyard in Japan wanted to help with this one and, eventually, engineers from Honda did the job. They were friendly, expert, extremely helpful, and did a wonderful job re-welding the cast-iron guide.

Initial calculations showed that a temperature difference of 150°C should produce relaxation of the shrink fit. This could be achieved by gentle heating of the web in the final stages of cooling of the crankpin. For the re-alignment, dry ice was packed into the tank, and pre-cooled the journal and pins for thirty hours before introducing the liquid nitrogen. Liquid nitrogen was piped from tankers on the wharf to the engine room and, via a copper pipe, through the dry-ice tank and into the oil holes in the crankshaft, which had the ends of the oilways plugged. 4222 L of liquid nitrogen was delivered from road tankers and, after nine hours, when the estimated temperature of the pin counterbore was –130°C, four propane oxygen torches applied heat to the outside of the crank web. After fifteen minutes, the forcing jack pressure was set to 200 kg/cm^2 (19.6 MPa), increasing a minute later to 400 kg/cm^2 (39.2 MPa) and the web began to move. The flow of nitrogen and the torches were turned off, and a pressure of 200 kg/cm^2 (19.6 MPa) kept the web moving until the reference marks were realigned. It worked! No further movement was necessary, and the shrink fit re-applied itself during the night as the temperatures returned to normal.

A static torque test of 355 tons-ft (1078 kN-m) was applied to the crank web the following morning and held for 30 s. A torque of 250 tons-ft (759 kN-m) was held for ten minutes. Nos. 4 and 5 main bearings were then re-white-metalled, and Nos. 3 and 4 main bearings required adjustments. The repaired bottle-guide assembly was reinstalled. In consultation with the LR surveyor, the engine was run alongside the wharf for several minutes at 35 RPM, and then at 70 RPM for twenty minutes. On stopping the engine, all running gear was felt by hand and found cool, and the reference marks remained in alignment.

Aftermath

The LR surveyor boarded for the voyage to Kobe, and engine RPM were varied for an hour and then set to 90. After ten hours this was gradually increased to 112 RPM, where indicator card readings were taken for an indicated power of 5000 HP (3729 kW). Engine RPM were then reduced to 100 and maintained for the remainder of the voyage. At Kobe, the engine was run full ahead and full astern for ten minutes. When opened up, the LR surveyor checked all reference marks and bearings. He issued a certificate for operation, requiring a re-inspection in one year's time, and *Eastern Rover* continued in service and was able to deliver the latex and oil cargoes without mishap.

Questions

Some further points of interest emerged during question time.

Richard showed a method of his own devising for aligning the crankshaft in the bearings by taking deflections of the crank webs, which takes the guesswork out of the operation. He showed measurements taken on this vessel, requiring only two trials to obtain satisfactory alignment. The method is shown in detail in his paper on the subject, published in two parts in *Marine Engineers' Review*, April and May, 1974 (*available in the State Library of NSW; see the online catalogue at www.sl.nsw.gov.au* — Ed.)

In reply to a question on the modern application of common-rail fuel supply to smaller diesel engines, Richard indicated that, twelve months ago, one of the marine engineering journals had skited that engine manufacturers had come up with a new method of fuel injection: common rail! Doxford engines have had common-rail fuel supply since before World War II, so there is nothing new about common rail. What *has* changed is that today's computer control can accurately change the amount of fuel supplied, and the timing of the supply.

The vote of thanks was proposed by Jack van Dyke.

Phil Helmore

Western Australia

The WA Section held its Annual General Meeting recently and elected a new committee for 2004/2005. There are a few younger members this year, with some of the long-running members standing down after four years with the committee.

The new committee is:

Chair	Shaun Ritson
Deputy Chair	Ken McAlpine
Secretary	Bronwyn Adamson
Treasurer	Damien Smith
Committee members	Tim Gourlay, Rohan Irvin, Marius Martens, Breytan Menzies, Pete Randhawa and Colin Spence.

The AGM was followed by a very informative presentation by Martin Grimm on *The Use of Hydrofoils for High-speed Craft*. Martin started with a complete history of the hydrofoil, followed by efficiency comparisons between hydrofoil craft and monohulls or multihulls. Some insights into the stability and seakeeping characteristics of hydrofoil supported craft were also given.

Tim Gourlay

Queensland

The Queensland Section met for its 2004 Annual General Meeting at the Gateway Campus, North Brisbane Institute of TAFE on 2 March 2004. The meeting was followed by a technical presentation. Brian Robson told the meeting that he intended to step down from the Chair's position after four years, but was willing to continue as a committee member. Brian felt that after forty-five years as a member of the Australian Division, of which more than twenty years had been spent as a committee member, council member and Division President it was time to step down and make way for younger members with new and fresh ideas. The following committee was elected for 2004.

Chair	Bill Barlow
Deputy Chair	Dion Alston
Secretary/Treasurer	Brian Hutchison
Members	James Stephen
	Alan Prigg
	Brian Robson
	Ross Burchill
	Gillian Carter
	Adam Podlezanski

After the conclusion of the AGM a technical presentation was given by Wendy Protheroe, head of the Marine Industries Taskforce of the Queensland Department of State Development and Innovation on *The Role of the Queensland Industries Taskforce*. Wendy detailed the priority role of the Marine Industries Task Force to develop an internationally-competitive marine industry in Queensland, to be achieved through regional growth creating employment opportunities. Strong growth in the marine sector is being driven by the growth of boat registrations of about 5% per year, which is almost twice the rate of growth of Queensland's population, a definite trend towards larger vessels causing increased demand for berths and docking facilities, demand for 'exclusive' charter services, reluctance of locals to travel overseas because of international unrest, and Australia recognised as providing safe waters and an alternative to Mediterranean and the Caribbean.

The Task Force classified relevant manufacturing, supplies, training, infrastructure, on-the-water tourism, the design, construction and refit of recreational, commercial vessels and super yachts as components of the marine industry that had developed its Queensland Marine Industry Profile. Within this context the Task Force worked with local industry in various regions in Queensland to determine short-to-medium term actions that would result in increased business opportunities including identifying competitive advantages and taking into account impediments to growth. Wendy also described the Task Force addressing the processes involved in sustainable infrastructure development. Key projects are at the Gold Coast, Brisbane Marine Industry Park, Rivergate and in Mackay.

The Task Force was working with industry to encourage and facilitate the analysis of its skill requirements within the context of growth to develop a strategy of skill acquisition and training combined with state-of-the-art-retooling, adoption of lean manufacturing processes, efficient waste-management practices and accelerated new-product development. Wendy pointed out that Queensland builders/manufacturers accounted for 67% of Australian exports of recreational vessels, a large number of firms which had a workforce of more than 50 persons, and a significant number of firms building/refitting in the 'super' category. Although Queensland firms had a smaller percentage of the commercial market, their activity was in the construction/refit of low wash ferries and patrol boats, in the defence area and in support contracts.

Finally, Wendy drew attention to industry, state and regional intelligence that may be researched on www.sd.qld.gov.au/marine.

Special Meeting of Members and Prospective Members with Trevor Blakeley, Chief Executive of RINA, in Cairns, North Queensland

Using a PowerPoint presentation, Trevor Blakeley outlined the founding and history of RINA that has developed to an internationally-recognised organisation — but one that happens to have its headquarters in London. RINA has members in 92 countries, with student members in 54 universities around the world, and a substantial proportion of the membership of its governing Council is from countries other than the United Kingdom. Trevor explained the interface of RINA with other professional bodies and how it surveyed members to ensure it was responsive to their interests and provided value for money.

The Chief Executive detailed the role of the Institution in providing for the skill/knowledge currency of members by means of a range of technical meetings, short courses and publications, pointing out that it was the professional responsibility of each member to ensure their skill/knowledge was in line with their work. Trevor set out the responsibilities of each member with respect to the RINA Code of Professional Conduct and how complaints are processed by the Institution.

Trevor explained the various categories of membership and the routes amongst them for upgrade, including a combination of possession of formal qualifications and the submission of a professional development manual documenting experience.

In response to questions, Trevor detailed how members may access technical information — some free of cost, but some others for which RINA is obliged to recoup cost. To illustrate the availability of RINA technical information, he explained that the Institution Transactions back to 1860 are available through the Institution website. Trevor identified the publications provided to members and reminded the meeting that all students are provided with Institution publications free of charge.

Don Fry questioned whether consideration had been given to providing for industry firms to become 'members' of RINA, pointing out that this would be an appropriate strategy to increase the Institution membership and hence its revenue base. Trevor Blakeley responded that Council had agreed, in principle, for a category of affiliate membership for companies and that draft criteria/guidelines were currently being developed, but pointed out that such affiliate membership was not intended to provide companies with input to the Institution decision-making process. Trevor

added that, with respect to the current categories of membership, a process was underway to streamline the membership application process but without any diminution of standards.

Brian Hutchison mentioned the difficulty in responding to enquiries on the availability on courses in naval architecture. He identified the main problem being that the indirect access through the website for intending Australian students was out of synch with streamlined hi-tech naval architecture. The Chief Executive said he would arrange for consideration to some minor redesign of the RINA website to ensure the user-friendly up-front access of information on the availability of courses/awards/prizes/etc. to prospective students/ members

Not suggesting, or requesting, a change of title for the Institution, Don Fry asked that, as RINA was an international organisation, was the term 'Royal' in its name inappropriate? Don asked if Trevor thought that in many countries its inclusion acted as a deterrent to would be members. Trevor responded with examples of the numbers of members in countries that were republics, setting out that he had not experienced any problem.

Brian Hutchison outlined recent problems confronting the Queensland Section in implementing its policy of providing the opportunity for all members throughout Queensland to participate and be involved in Section activities. He mentioned that teleconferencing equipment was not as available when the Queensland Section was established, and the high cost of purchasing it. The problem became compounded in securing a venue in which the equipment could be used — telephone adaptation, the need for speakers for a large meeting, how to invoice the Section, etc. Members suggested that, consistent with Section policy of inclusion the Queensland Section should consider purchasing its own equipment and/or research hire, etc., from instrumentalities such as Telstra. It was also suggested that Queensland Section approach the Australian Division requesting it to consider providing teleconferencing/speaker equipment to Sections having membership distributed over their State/Territory to maximise the opportunity for member participation. Don Fry also drew attention to the high cost of the equipment. Trevor Blakeley said he would arrange for information on the cost and availability of the equipment used by RINA in London to be sent to Queensland Section — he thought the equipment used in London was available at much lower cost

Trevor Blakeley accepted the invitation of Don Fry for a tour of work in progress at NQEA Australia and thanked all for meeting with him.

Brian Robson

COMING EVENTS

NSW Technical Meetings

Technical meetings are generally combined with the Sydney Branch of the IMarEST and held on alternating first Wednesdays and Thursdays of each month in the Harricks Auditorium at Engineers Australia, 118 Alfred St, Milsons Point, starting at 5:30 pm for 6:00 pm and finishing by 8:00 pm. The program of meetings remaining for 2004 (with exceptions noted) is as follows:

Wed 2 Jun	Jeremy Spear, Spear Green Design *Marine Styling and Interior Design*
Thur 1 Jul	Jon Clemesha/Mark Taylor, Defence Maritime Services *The Design of the Armidale-class Patrol Vessels*
Wed 4 Aug	Hugh Durrant-Whyte, Australian Centre for Field Robotics *Automation of Container-handling Operations*
Thur 2 Sep	Stephen Quigley/Robert Tulk, North West Bay Ships *Trimarans: The Ships of the Future*
Wed 6 Oct	Colin Rudd, Sydney Ports Corporation *Port Botany Expansion*
Thur 2 Dec	SMIX Bash 2004

Western Australian Seminar

The WA Section, in association with Engineers Australia and the Centre for Marine Science and Technology, are holding a special seminar on Thursday 22 July, 6–7pm, in the auditorium of Engineers Australia. The speaker is Professor Peter Jackson from the Yacht Research Unit, University of Auckland, on the subject *An Engineer Goes Sailing*.

Queensland Technical Meetings

The next Technical Meeting will be held on Tuesday 6 July at the Boat and Ship Building Section, L Block, Gateway Campus, North Brisbane Institute of TAFE, 776 Kingsford Smith Drive, Hamilton. The presentation will commence at 6:30 pm and will be given by Colin Lough from Performance Propellers on *Aspects of Propeller Design*. Interstate visitors will be most welcome.

Fisher Maritime Training Programs

The Fisher Maritime Consulting Group, headed by Dr Ken Fisher, is returning to Australia in 2004 with its well-known and widely-respected Contract Management training programs. The programs will be held over three days, both in Sydney and Fremantle, as follows:

Sydney	Wed 27 to Fri 29 October
Fremantle	Mon 1 to Wed 3 November

Put the dates in your diary now, and full details and a registration form will be forthcoming with the August issue of *The ANA* (these are already available online at www.fishermaritime.com).

Ausmarine 2004

For the sixth time, the commercial and government maritime worlds will come to Fremantle for this major conference and exhibition. Ausmarine 2004 will bring together owners and builders, designers and suppliers, servicers and policy makers in an efficient and effective market place which will be convenient, beneficial and enjoyable. The conference will be held on 26 and 27 October, and the exhibition will be held on 26 to 28 October. Both will be held adjacent in the Fremantle Passenger Terminal, in the centre of the busy port.

The two-day conference will be a practical and useful event for owners, operators, designers and builders of commercial vessels, including cargo ships, military and patrol boats, pilot boats, rescue craft, fishing boats, aquaculture craft, passenger and vehicle ferries, tugs, offshore support vessels and many more. The early-bird discount for conference registration concludes on 10 August.

The exhibition will have on display marine products and services sourced from throughout the world, from vessel design through construction and materials to engines, electronics and deck equipment. All the makings of a complete vessel, and government services, financiers and classification societies, will be showcased.

The social program includes the Ausmarine Cocktail Party on 26 October, and the Exhibitors' Happy Hour on 28 October.

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

RINA at AusMarine

The Western Australian Section of RINA are, as usual, organising their own mini-conference in association with Ausmarine 2004 in Fremantle. Details will be forthcoming; watch this space.

HoverWorld Expo 2004

In commemoration of the World's First Hovercraft Race held in Canberra in 1964, HoverWorld Expo 2004 will take place from 28 December 2004 to 3 January 2005 on Lake Burley Griffin's Black Mountain Peninsula, near the site of the 1964 race. HoverWorld Expo will be an all-inclusive air cushion vehicle event patterned after World Hovercraft Week 2002 in Terre Haute, Indiana USA in which 18 nations participated.

HoverWorld Expo 2004 will encompass the first World Championship Hovercraft Endurance Race; a Pioneer's Race among the original 1964 competitors; the Hovercraft World Speed Record Challenge; a cruise on the Molonglo River; the Canadian Air Cushion Technology Society's 28th International Symposium on Air Cushion Technology; and the second World Symposium on Hovercraft Rescue. In addition, Tech Talks by notables in the field of hovercraft technology will be given throughout the week, and an elaborate hovercraft exhibit will be on display at the National Science and Technology Centre.

Further details can be obtained from the article in the February 2004 issue of *The* ANA, as well as from the website www.hoverworldexpo.com or from Professor Lawrence Doctors on (02) 9385 4098 or email L.Doctors@UNSW.edu.au.

CACTS 28th International Symposium on Air Cushion Technology Call for Papers

As a part of HoverWorld Expo 2004, the Canadian Air Cushion Technology Society's (CACTS) 28th International Symposium on Air Cushion Technology will take place from 29 to 31 December 2004 at the Australian National University. Papers on all aspects of air cushion technology may be submitted; papers addressing sport- and racing-hovercraft design are particularly encouraged. Papers on any aspect of hovercraft rescue may also be submitted for presentation at the 28 December second World Symposium on Hovercraft Rescue.

The deadline for submission of abstracts is 28 June 2004. Further details can be obtained from the article in the February 2004 issue of *The ANA*, as well as from the website www.hoverworldexpo.com, where a list of suggested topics and submission instructions may be found at www.hoverworldexpo.com/callforpapers/callforpapers.htm. You may also contact Professor Lawrence Doctors, who is serving as Chairman of the Symposium, on (02) 9385 4098 or email L.Doctors@UNSW.edu.au.

Marine Safety 2005

The National Marine Safety Committee will host Australia's premier marine safety event, the Marine Safety 2005 conference, at Wrest Point, Hobart, on 11–13 April 2005. This conference follows the successes of the Marine Safety conferences in Brisbane in 2002 and Sydney in 2003. As with past conferences, NMSC is inviting all sectors of Australia's marine industries to participate. For further information, contact NMSC on (02) 9247 2124, email secretariat@nmsc.gov.au, or visit the website www.nmsc.gov.au.

Pacific 2006 International Maritime Conference

The Pacific 2006 International Maritime Conference (organised by the Royal Institution of Naval Architects, the Institute of Marine Engineering, Science and Technology and Engineers Australia) will be held at the Darling Harbour Convention and Exhibition Centre in Sydney from 31 January to 3 February 2006.

HIPER 06 at AMC

The fifth International Conference on High Performance Marine Vehicles (HIPER) will be held between 8 and 10 November 2006 at the Australian Maritime College in Launceston. HIPER Conferences are held once every two years. The inaugural conference was held in South Africa in 1999; subsequent ones have been held in Hamburg in 2001 and Bergen in 2002, and the fourth will be held in Rome in September 2004. Dr Prasanta Sahoo is the Convenor of the fifth HIPER conference which will be held in late 2006. Watch this space for forthcoming details. In the meantime, for further information contact Dr Sahoo on (03) 6335 4822 or email p.sahoo@mte.amc.edu.au.

GENERAL NEWS

US Army Helicopters Make History on *Joint Venture*

Two US Army Blackhawk helicopters made history recently with the first landings on board a US Army vessel since the Vietnam War. After a break of thirty years, the Blackhawks touched down on the deck of the US Army vessel *Joint Venture* at 10:57 am (Korean time) on Thursday 25 March 2004.

HSV-X1 *Joint Venture*, built at the Hobart shipyard of Incat Australia, has been on lease to the US military since late 2001. The high-speed ship completed a major refit at the Tasmanian Incat yard in late 2003 and is now stationed in Hawaii under the command of US Army Pacific. The vessel was in Korean waters to support the Army's Reception, Staging, Onward Movement and Integration exercise (RSO&I) run in the last week of March.

The Blackhawk helicopters assigned to Company B, 1st Battalion, 52nd Aviation Regiment, 17th Aviation Brigade were taking part in exercises off the coast of Korea where the historic occasion took place. Historically significant for the US Army, the landing of helicopters on board *Joint Venture* has been carried out on numerous occasions but only by the US Navy, when the Navy operated the vessel. The two helicopters offloaded passengers then performed pilot landing certifications operations, consisting of each pilot landing on the flight deck at least five times.

The Army's last shipboard landings occurred during the Vietnam War on board *Corpus Christi Bay*, when the ship was used for helicopter maintenance. *Corpus Christi Bay* was a US Navy ship recommissioned by the Army in the mid 1960s. *Joint Venture* demonstrated how high speed vessels like this, supported by aircraft, can expand the Army's capability to rapidly move/remove troops and equipment from remote areas previously thought inaccessible.

A UH-60 Blackhawk helicopter from the 17th Aviation Brigade, South Korea takes flight after making a historical landing on the USAV *Joint Venture* ten miles off the Pyongtaek Port, South Korea, on 25 March 2004.
(US Army photo by SPC Eric E. Hughes)

Anzac Frigate *Perth* Launched at Williamstown

Thousands of people converged on the Tenix Defence shipyard at Williamstown on the afternoon of Saturday 20 March 2004 to join in the celebration of the launching of the Anzac-class frigate *Perth*. The tenth, and last, Anzac frigate to be built by Tenix, *Perth* was named and launched by Ms Margaret Gee, the daughter of the late Able Seaman First Class Allan (Elmo) Gee, who was a helmsman and Captain's bugler in the first HMAS *Perth* during her final battle in the Sunda Strait in 1942.

Ms Margaret Gee with Olivia Slee and Luke Sewart who presented her with a bouquet of flowers prior to the ceremony
(Photo John Jeremy)

Ready to go — trigger locks and pins displayed at the head of the slipway
(Photo John Jeremy)

Green light displayed — but a maul handy just in case — the trigger crew standing by
(Photo John Jeremy)

Perth on the way to the sea
(Photo John Jeremy)

Whilst *Perth* has a further period of fitting out, setting-to-work and trials before she joins the RAN in 2006, the launching marks an end stage in one of the most successful naval shipbuilding projects in Australia's history.

Tenix and its employees can be justly proud of their achievements during the ten-ship, 17-year fixed-price contract which is currently worth about $A7 billion. Not only has the project provided Australia and New Zealand with some useful and capable ships, but the capability to support and modernise the class has been developed and maintained, an essential capability for Australia's self reliance. It is also estimated that the project has generated some $200 million to $500 million in additional annual GDP during the construction phase with some 7 850 full-time equivalent jobs.

New Zealand has also benefited substantially from participation in the project. All superstructure and some of the hull modules for *Perth* were constructed at the Tenix facility at Whangarei in New Zealand.

Following the recent hand-over of *Ballarat* to the RAN, only *Perth* and *Toowoomba* remain to be completed. Whilst the reception for some two thousand guests held after the launching in the module hall at Williamstown was memorable, in an ideal world it should not have been possible. Naval shipbuilding in Australia has been characterised by 'stop-start' programming and, although another large programme is in the offing, the neat and tidy (but empty) appearance of the Tenix yard clearly illustrated the problems faced by shipbuilders when continuity is lacking.

Perth approaching the fitting-out berth as a Seahawk helicopter flies by with the white ensign
(Photo John Jeremy)

Tenix Selected for NZ Project Protector

Tenix Defence Pty Ltd is excited to be chosen as the preferred tenderer to provide the Royal New Zealand Navy's next generation of ships through Project Protector.

The company's Chief Executive Officer, Robert Salteri, said on 6 April that it was a great privilege for the company to be selected in an international competition as preferred tenderer to build all three ship classes required in Project Protector.

An impression of the multi-role ship and the offshore patrol ship offered by Tenix to the RNZN
(Image courtesy Tenix)

"We thank the New Zealand Government, the Defence Minister, the Honourable Mark Burton, and the Ministry of Defence for their confidence in us. We recognise that we still need to satisfy a range of demanding requirements from the Government prior to contract signature, and look forward to working with the Ministry over the coming months to achieve this outcome," Mr Salteri said.

"This is a fantastic opportunity not only for Tenix but for a wide range of New Zealand and Australian companies, and builds upon the considerable benefits already delivered through the Anzac-frigate program," he added.

Australian Defence Minister, Robert Hill, welcomed the New Zealand Government's decision to select Tenix Defence Pty Ltd as the preferred tenderer for the $NZ500 million project. Senator Hill congratulated Tenix on being selected and said this provided further evidence of the strengthening of the Australian and New Zealand Defence and industry relationship that had been established through the Anzac-frigate project, which has been one of Australia's largest and most successful Defence projects.

Project Protector will supply the Royal New Zealand Navy with a multi-role vessel, capable of undertaking such tasks as tactical sealift and disaster relief, and in-shore and off-shore vessels to meet New Zealand's surface patrol requirements.

An impression of the Tenix inshore patrol vessel for the RNZN
(Image courtesy Tenix)

Tenix Delivers Eighth Anzac-class Frigate to RAN

The eighth Anzac-class guided missile frigate to be built by Tenix Defence, *Ballarat*, was delivered to the Royal Australian Navy on 30 April at Tenix's Williamstown shipyard in Melbourne.

Tenix Managing Director Mr Paul Salteri officially handed over the vessel to Director General, Major Surface Ships, Commodore Keith Malpress and Commanding Officer, Commander David Hunter in front of the ship's company.

The keel of *Ballarat* was laid on 4 August 2000 and she was launched on 25 May 2002. The ship is scheduled for commissioning into the RAN in mid-2004.

Ballarat is the second RAN ship to bear the name. The first HMAS *Ballarat* was a minesweeper launched in December 1940. She served with distinction during World War II and is known for rescuing Flying Officer J.G. Gorton, RAAF, who later became Prime Minister of Australia.

Tenix Wins IT Commercialisation award

Australian defence and technology contractor Tenix's track record in IT commercialisation has been recognised at the Australian Information Industry Association's annual iAwards in Sydney. Tenix received the Commercialisation of Intellectual Property award for its development of Crossbow, a web-based tool that allows databases across organisations, countries, formats and content to be viewed and interrogated as a single, integrated and coherent "window".

The iAwards honour the "best of the best" solutions for the Information and Communications Technology (ICT) industry and are recognised by both Government and industry across Australia.

Tenix Group Managing Director Paul Salteri described Crossbow as "revolutionary".

"It can create a virtual data warehouse from many sources of information, such as law enforcement, construction, and R&D, very quickly and at a far lower cost than other data warehouse solutions, without disrupting vital operations," Mr Salteri said.

The product was originally developed at Tenix Defence's Williamstown shipyard in Melbourne to manage and streamline information associated with the company's $7 billion contract to build ten Anzac-class frigates for the Royal Australian and Royal New Zealand navies.

Tenix Investments is commercialising Crossbow's technology (patents pending), and is exploring new business opportunities in disciplines including law enforcement, health care, manufacturing, and construction.

Mr Salteri said the iAward recognised Tenix's strong commitment to advancing Australian technology and expanding its applicability.

"Tenix has established a new Australian company, Tenix Connections, to market Crossbow domestically and overseas," Mr Salteri said.

"We are already actively working with two companies in the USA to further define the market and we have identified key targets for future co-operation," he said.

Shipbuilding at Newcastle

Shipbuilding has returned to Newcastle with the first vessel for many years under construction at Tomago. The vessel under construction at Forgacs Shipyard, Tomago (formerly Carrington Slipways) is a 35 m aluminium luxury catamaran to a design by Crowther Design for operator JR Tours.

The 35 m catamaran under construction at Forgacs Shipyard
(Photo John Jeremy)

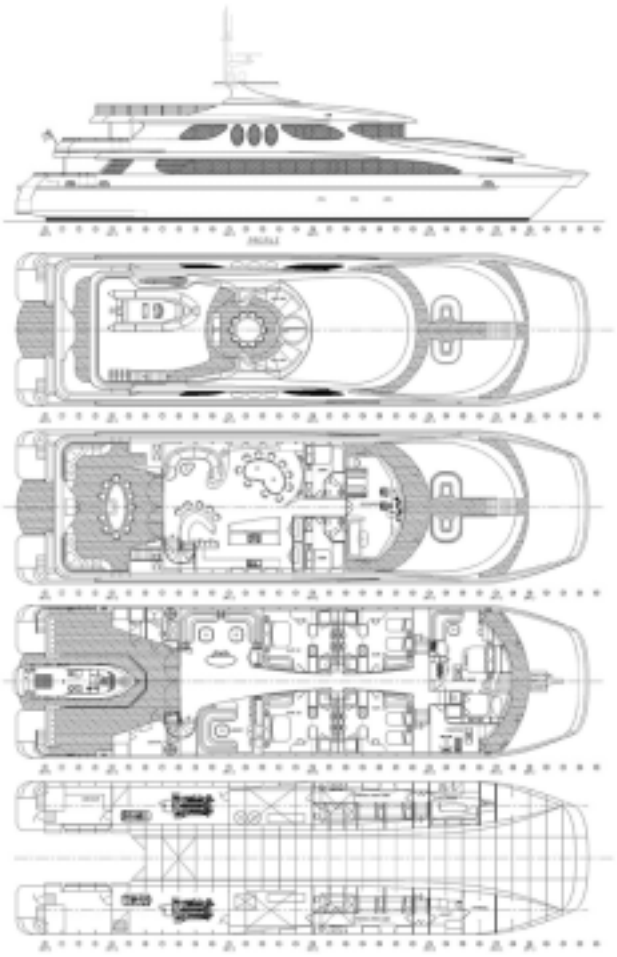
Crowther Designs' 35 m Catamaran for JR Tours
(Image courtesy Crowther Designs)

The vessel is intended for service in North Queensland waters and will accommodate ten passengers in some style. A 6.5 m tender will be carried on a retractable launching platform sited between the hulls at the stern.

Forgacs will complete the vessel to a lock-up stage so that it can be steamed to Brisbane for internal fit-out. The vessel is being built the right way up, with the hull plated and work well under way on erecting the superstructure. Completion and sea trials are scheduled for the end of the year.

Principal particulars of the vessel are as follows:

Length measured	34.80 m
Length WL	34.60 m
Beam OA	11.00 m
Draft (skeg)	2.05 m
Draft (hull)	1.60 m
Passengers	10
Crew	10
Fuel	2 x 15 000 L
Fresh water	5 000 L
Deadweight	45.1 tonnes
Engines	2 x Caterpillar 3512B each 1678 kW @ 1925 rpm
Gearboxes	2 x Twin Disc ZF BW 465
Speed	26 knots
Construction	Aluminium
Survey	USL Code Class 2B



General Arrangement of Crowther Designs' 35 m Catamaran for JR Tours
(Drawing courtesy Crowther Designs)

New Manager for Devonport Dockyard

It was announced on 17 March that the New Zealand Defence Force has selected a joint venture between the UK-based VT Integrated Services plc and Fitzroy Engineering Ltd of New Plymouth (VTF) as its preferred tenderer for the management the Navy's Dockyard at the Devonport Naval Base in Auckland for the next ten years. The existing contract has been managed by Babcock New Zealand Limited (BNZL) since 1994. The Chief of Navy, Rear Admiral Peter McHaffie, praised BNZL for its management of the Navy dockyard. "Over the past ten years Babcock New Zealand Ltd has successfully assisted Navy to transition its dockyard to be more commercially focused and deliver benefits to both parties," he said. "The last ten years with BNZL have demonstrated to us the benefits of having the Navy Dockyard managed by a commercial organisation. We chose to continue with a commercial manager and so went out to the market to seek proposals. Our selection process narrowed the final choice down to two organisations — BNZL and VTF. Selecting VTF does not imply a vote of no confidence in BNZL — rather they were competitive but not enough."

VTF is expected to employ all or most of the existing workforce when it takes over on 1 July. The change of contract manager will see a name change and some senior managers replaced. Apart from these changes, it will be business-as-usual for the Dockyard.

Another Austal Ferry for Greek Owner

On 2 April Austal Ships announced a contract to build an 85 m vehicle-passenger ferry for the Greek operator Hellas Flying Dolphins (HFD). The catamaran is the fifth fast ferry HFD has ordered from Austal Ships, demonstrating ongoing confidence in Austal's capabilities.

HFD is Greece's largest domestic-ferry operator, transporting approximately 7 million passengers, 200 000 trucks and 800 000 cars every year. Due for delivery in the 2005 European summer and to be named *Highspeed 5*, the ferry will bring the total number of vessels in the HFD fleet to 24.

HFD's General Manager, Vassilis Zacharioudakis, said: "Our high-speed fleet is synonymous with state-of-the-art transportation. We are proud to introduce *Highspeed 5* to the Eastern Mediterranean market in 2005."

Benefiting from Austal's experience during construction of the 92 m *Highspeed 4* (delivered in July 2000), the new catamaran will have three classes of seating (VIP, business and tourist), each with its own bar and facilities. With capacity for 154 cars (or four coaches and 131 cars) and 810 passengers, the vessel will have a sophisticated level of fitout, disabled-persons access (including a lift) in compliance with European Union regulations. Crew accommodation for 36 will be provided.

In keeping with the stern-to mooring style commonly used in Greece, the vessel will provide separate passenger and vehicle-loading ramps. The bi-fold ramp enables loading and unloading onto a low landing stage and the ferry will be equipped with high-speed anchor winches and mooring winches to allow for efficient berthing.

The boarding area will lead to a baggage room on the mezzanine deck and, for the comfort of passengers when boarding, dry exhaust funnels have been designed to direct main engine exhaust fumes away from the ramps and other passenger areas.

The ferry's propulsion system will consist of four diesel engines and waterjets to provide a service speed of 37 kn.

The new contract took the number of Austal vessels on order across the group's four shipyards to 30 including a 127 m trimaran ferry for Fred. Olsen SA and 22 patrol boats.

Principal Particulars

Length overall	85 m
Length waterline	78 m
Beam moulded	21.2 m
Hull depth moulded	6.5 m
Hull draft (maximum)	2.9 m
Deadweight (maximum)	470 t
Crew	35
Passengers	
VIP	120
Business	408
Tourist	282
Total	810
Vehicle deck clear height	4.5 m
Fuel (approx)	115 000 L
Classification	Germanischer Lloyd

The Profile of the new ferry *Highspeed 5*
(Image courtesy Austal Ships)

Work Starts on RAN Patrol Boats

Production of the Royal Australian Navy's (RAN) Armidale-class patrol boats began at Austal Ships on 4 May. To be built in Western Australia over a 42 month period, the 12 vessel fleet will act as the principal maritime patrol and response element of Australia's National Civil Surveillance Program.

Project partners Austal Ships and Defence Maritime Services (DMS) held a ceremony to mark the start of production of the first ship in the class, *Armidale*, which was attended by Senator David Johnston, Senator for Western Australia, representing the Minister for Defence, key personnel from the Department of Defence and Defence Materiel Organisation and Patrol Boat Group Commander, Captain Peter Marshall.

Armidale is to be launched in January and delivered in April 2005. The second and third Armidale-class vessels will follow six months later.

Based in the ports of Darwin and Cairns, the Armidale-class fleet will operate to the limits of Australia's exclusive economic zone. The vessels are designed for operation in the tropical sea and weather conditions of Australia's northern waters as well as the Southern Ocean, such as the South Tasman Rise Fishery which lies some 300 nautical miles south of Tasmania (48ºS). The vessels will also be capable of deployment to Christmas and Cocos Islands and to other countries in the region for occasional exercises and cooperative operations.

Production of *Armidale* begins — (L to R) Austal Ships Executive Chairman, Mr John Rothwell, Defence Maritime Services Chairman, Mr Ross Brewer, Austal Ships worker, Dave Johns, Patrol Boat Group Commander, Captain Peter Marshall, and Senator for Western Australia, Senator David Johnston.
(Photo courtesy Austal Ships)

Amphibious Support Ship Progress

The Minister for Defence, Senator Robert Hill provided a progress report on the acquisition of new logistic support capability for the RAN at a conference in Canberra recently. Addressing the inaugural congress of the Australian Defence Magazine at the National Convention Centre on 24 February he said:

"The Government also intends that the major ship construction and upgrade programs announced in the Defence Capability Review provide a major boost to the local shipbuilding industry.

"Defence has settled in principle the capability requirements for the new amphibious support ships. "The two ships will replace HMAS *Tobruk* and one of our LPAs. They will need to be able to embark, sustain and transport by sea an amphibious combined arms battle group together with their equipment and supplies. The force needs to be able to train and rest while en route to operations. The ships will need the capability to carry and tactically deploy several hundred vehicles, including armour, plus trailers. They will also need the ability to airlift simultaneously an air-mobile combat team from 12 helicopter-launch spots between the two ships.

"They will each have hangar space for at least 12 helicopters and at least four conventional landing craft that are capable of carrying our new tanks. The ships must also be capable of providing the necessary command, control and communications to direct the battle group's amphibious landing and follow-on forces. Of course, given the prospect of Australian and US forces continuing to work closely in the future, the ships will need to be interoperable with our coalition partners.

"Defence has issued a request for information to two international ship builders — the Spanish company IZAR and the French conglomerate Armaris — concerning their respective new LHD designs. This will help inform the decision on a preferred design.

"While the ship will be based on an overseas design, the translation of that design into a ship that is tailored to suit Australia's challenging environment will require a good deal of local knowledge and experience. Many of the ship's system components will be derived from local industries to ensure whole-of-life support for this capability.

"Four Australian ship building companies, ADI, Tenix, ASC and Forgacs have been asked to assist the Government with its design evaluation."

An impression of the Izar 221.4 m, 25 790 t LHD design
(Izar image)

Air-Warfare Destroyer Design Competition Begins

Three international ship designers have been selected to develop concept ship designs based on existing ship classes to enable the selection of Australia's new air-warfare destroyers, Defence Minister Robert Hill announced on 14 March.

This activity will lead to the selection of a preferred designer in mid 2005.

Spanish ship builder Izar will produce an evolved concept design based on the Alvaro De Bazan-class frigate (F100) which is currently in service with the Spanish Navy. Izar was selected because it has already designed an operational ship that has successfully integrated the United States' Aegis air-warfare system.

The first F100 frigate *Alvaro de Bazan* on trials in December 2001
(Photograph Izar)

Blohm + Voss of Germany will produce an evolved concept design based on the Sachsen-class frigate (F124) which is currently in service with the German Navy. Blohm + Voss was selected because of its knowledge of, and experience with, Australian industry flowing from its design of the very successful Anzac-class frigates. Whilst the F124 utilises a European air-warfare system, the concept design also offered a version of the Aegis system.

The first F124 frigate FGS *Sachen*
(Photo courtesy Department of Defence)

Gibbs & Cox of the United States will produce an evolved concept design based on a modified version of the Arleigh Burke-class guided missile destroyer (DDG-51), which is currently in service with the United States Navy. Gibbs & Cox have been selected as it was the lead-ship detail-design

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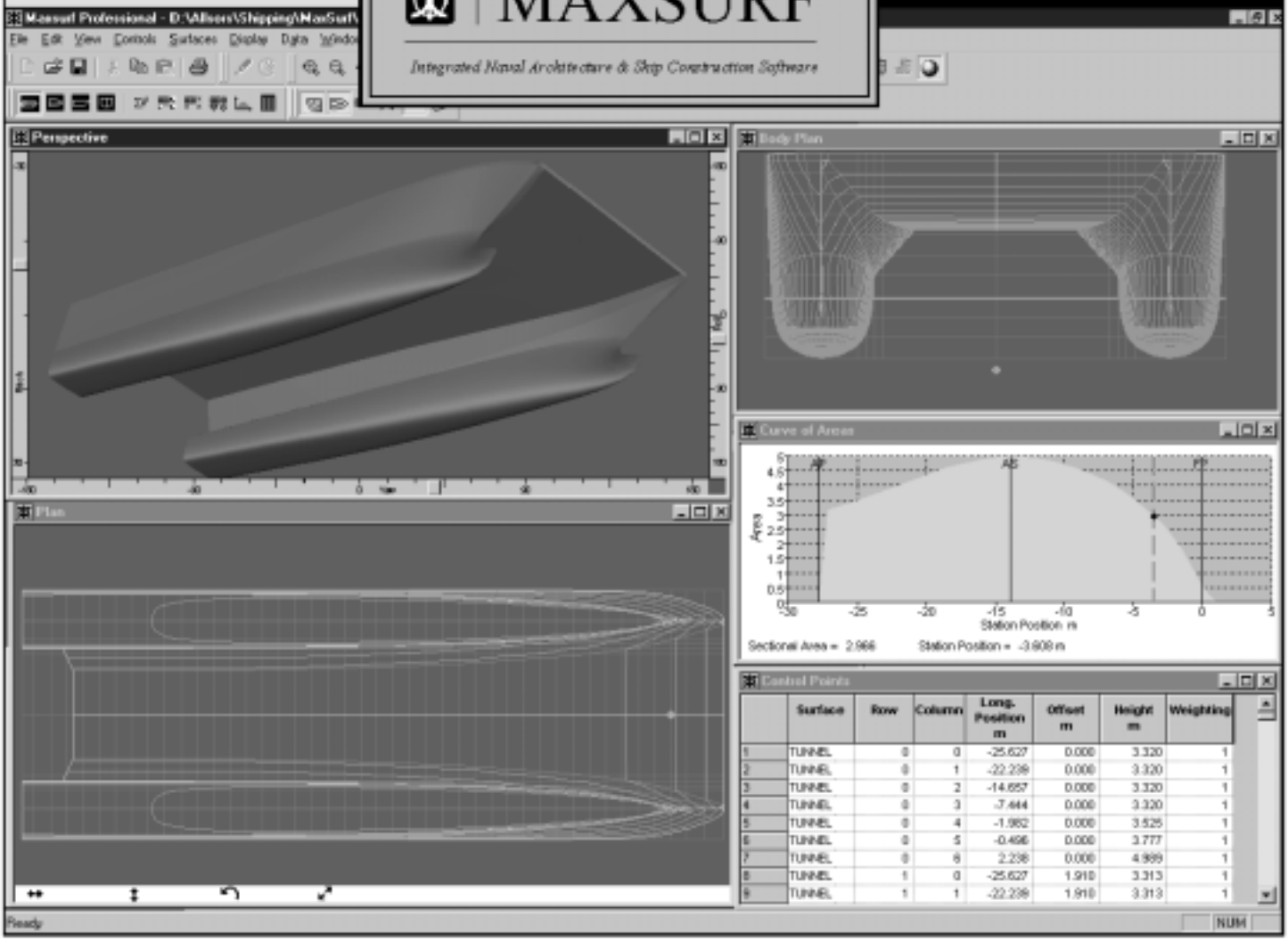


agent for the DDG 51 class and has vast experience with integrating various evolutions of the Aegis air-warfare system into the DDG-51 design.

USS *Lassen* (DDG82), a Flight IIa Arleigh Burke-class guided missile destroyer completed in 2001
(US Navy photograph)

The concept designs will be developed to meet the specific capability requirements of the Australian Defence Force. This process will occur in parallel with the design of the combat system for the new air-warfare destroyers.

Consistent with the Government's announcement last year that a United States-designed air-warfare system — most probably a variant of the Aegis system — will form the basis of the combat system for the new ships, the Government has requested that the United States Navy assist on issues related to the integration of Aegis into the design concepts. This would be under the recently signed Statement of Principles between the Royal Australian Navy and the US Navy for collaboration on surface ships.

Tenix and the Australian Submarine Corporation will be asked separately to assist Defence in the assessment of the designs and to advise the Government on the opportunities to maximise potential for Australian industry involvement in the project. The Australian shipbuilders have been engaged as advisers because of their experience in building large warships.

The first of Australia's three new air-warfare destroyers will be delivered in 2013. The new ships will be constructed at a cost of $4.5 billion to $6 billion.

These large ships will be capable of detecting and shooting down aircraft at extended ranges and protecting deployed forces from air and missile attack. This will ensure Australia's amphibious and support ships can operate with 24-hour air defence, as well as supporting land forces in coastal areas and aircraft such as the Airborne Early Warning and Control, AP3-C Orions and C130 Hercules aircraft.

The air-warfare destroyers will also have an anti-submarine and anti-shipping capability. There is also the potential for the ships' sensors to be used to detect ballistic missiles in flight.

New CEO for ASC

On 10 March the Australian Submarine Corporation's Board of Directors announced the appointment of Mr Graeme Bulmer as Acting Chief Executive Officer of ASC.

Mr Bulmer, an engineer, has been a director of ASC since the Company became wholly-owned by the Commonwealth in November 2000, and has extensive executive experience in the manufacturing industry in Australia and Asia. He was an executive with BTR Nylex for over 30 years, including a five-year term as Executive Director and eight years heading three public companies in Taiwan.

Mr John Prescott AC, Chairman of ASC, said "Mr Bulmer has been closely involved in the changes being implemented to fully equip ASC for its role as the provider of through-life support for Australia's Collins-class submarines, in addition to further developing ASC's capabilities for other naval work."

"The company is conducting a world-wide executive search to select a new Chief Executive Officer. The Board is very pleased that Mr Bulmer is able to fill the position in the interim," he said.

"The Government has made clear its intent to privatise ASC and, in preparation for this, the Board is moving to fully establish the company's capability in Australia's naval shipbuilding and repair industry."

In accordance with ASC's policies on corporate governance, Mr Bulmer will stand down from the Board while Acting Chief Executive of ASC.

Submarines Achieve 'Operational Release' Status

On 3 March the Defence Minister, Robert Hill, announced that the Royal Australian Navy had accepted 'Operational Release' of the six Collins-class submarines.

This important milestone acknowledges the submarine's ability to achieve defined operational outcomes laid down in the Defence Preparedness documentation.

While some aspects of the class require future rectification or modification, the Operational Release rating recognises that the submarines are now providing an important national defence capability.

Senator Hill said the Navy was now confident in the submarines' ability to undertake operational employment pending completion of the current set of capability upgrades.

"The Collins-class submarines are the most capable conventional submarines in the world, providing Navy with a long-endurance, quiet, shock-resistant and stealthy capability," Senator Hill said.

"The government's decisions to make interim modifications to the current combat systems, to upgrade the boats for better acoustic performance and reliability, to enter into a statement of cooperation with the United States Navy so that we can utilise its technology and expertise, to acquire a replacement combat system and a replacement anti-surface warfare and anti-submarine heavyweight torpedo is clearly paying dividends.

"Although there are still some issues to be resolved, the Chief of Navy has agreed to the Operational Release of the submarines following outstanding results in exercises and real-world scenarios and intensive testing and evaluation of their capabilities.

"This is a significant milestone in the project and will provide the Navy with a world-class capability."

The Operational Release rating does not release contractors from responsibilities to address aspects that require outstanding rectification or modification.

Austal Launches First of Ten Patrol Boats for Yemen

On 26 February Austal launched the first in a series of ten fast patrol boats for the Republic of Yemen. It is the first naval vessel launched since the company announced the formation of Austal Defence, a new division that is focussed on exploiting the significant opportunities which exist for the company's aluminium vessel technology in the international military and law-enforcement markets.

The 37.5 m deep-V monohulls are a simplified version of the Bay-class patrol boats delivered to the Australian Customs Service in 1999/2000 and have been tailored to the customer's operating and budgetary requirements. Powered by twin 1305 kW Caterpillar V12 diesels they will be capable of 29 kn and have an operating range well in excess of 1000 n miles. Each vessel will be fitted with a 25 mm twin-barrelled naval gun and two 12.7 mm heavy machine guns and will carry three officers and 16 sailors.

Austal is on schedule to deliver the first four vessels for Yemen in June this year, with the remaining six vessels being delivered in pairs at two-monthly intervals.

Yemen patrol boat P1022 shortly before launching
(Photo courtesy Austal Ships)

Logistic Support for Amphibious and Afloat Support Ships

Kvaerner Facilities Management has been selected as the preferred tenderer to provide logistic support services to the Royal Australian Navy's troop carrying and replenishment vessels HMA Ships *Tobruk*, *Manoora*, *Kanimbla* and *Success*, Defence Minister Robert Hill announced on 12 March.

Senator Hill said the contract was expected to be worth up to $140 million over seven years.

"For the first time, a single prime contractor will be responsible for a range of services, including the design of logistic-support work programs and providing overall engineering and maintenance-requirements support to these vessels," Senator Hill said.

"This will ensure the Navy's supply ships, which are routinely deployed in support of operations to areas such as the Persian Gulf, East Timor and the Solomon Islands, continue to be maintained at a high standard until they are replaced towards the end of this decade."

Defence and Kvaerner have commenced contract negotiations, with contract signature expected in June.

New South Wales Industry News

New Design

Incat Designs – Sydney recently announced the signing of a contract between Gladding Hearn and New York Water Taxi for the US shipbuilder to construct two Incat Designs 22 m water taxis. Design work is proceeding apace.

The two vessels are scheduled for delivery in April and June 2005. They will be certified for 149 passengers, with the main cabin seating 99. The upper deck will have 36 seats and standing room for a further 39 passengers. The vessels are optimised for accessibility for the disabled, with allocated wheelchair spaces, spacious toilet facilities and large doors and passageways throughout. They are also optimised for bow loading to suit the standard New York dockside infrastructure. Passengers will be able to embark and disembark with direct access between the foredeck and main passenger cabin. The two vessels will also be designed to meet strict performance guidelines, particularly in the areas of wake/wash and interior noise levels.

Principal particulars of the two vessels are:

Length OA (excl sponsons)	72'-0'' (21.95 m)
Length WL	68'-2'' (20.77 m)
Beam overall (excl sponsons)	26'-7'' (8.10 m)
Beam demihull	7'-6'' (2.30 m)
Draft	5'-2'' (1.55 m)
Passengers	
Main Deck interior	99
Upper Deck exterior	36
Upper Deck standing	39
Main Engines	2 x Cummins QSK19-M
Gearboxes	2 x Twin Disc MGX-5145
Propellers	2 x Bruntons 5 bladed

Incat Designs – Sydney's Catamaran for New York Water Taxi
(Image courtesy Incat Designs – Sydney)

New Construction

Ellen MacArthur's new 23 m composite trimaran, *B&Q*, designed by Nigel Irens, has been completed by Boatspeed of Somersby, NSW. The hulls were transported to Sydney, assembled, and the vessel launched in January. For a series of photos covering the construction, launching and sailing trials, see Boatspeed's website, www.boatspeed.com.au. For *B&Q*'s maiden voyage, see *The Internet* elsewhere in this issue.

Incat Designs – Sydney has announced the recent launches of two new ferries. The 43 m *Seastreak Highlands* was launched at Gladding Hearn's Massachusetts, USA, yard in late February. This was quickly followed by the launch of

the 58 m ro-pax ferry *miCat* by Cairns boatbuilder, NQEA Australia, one week later.

Seastreak Highlands is the 165th Incat Designs – Sydney vessel to be constructed, and will join sister ships *Seastreak New Jersey*, *Seastreak Wall Street* and *Seastreak New York* on the run from downtown New York to Atlantic Highlands. These four new vessels are complemented by two other Incat Designs ferries, *Seastreak Manhattan* and *Seastreak Liberty*, operating from downtown New York to South Amboy. The four new ferries have proven very successful on this difficult route, with Seastreak New York approaching 10 000 operating hours next month since entering service three years ago . The vessels provide commuters from Atlantic Highlands with a smooth, fast and comfortable ride to the city. *Seastreak Highlands* includes some improvements in capacities over the earlier three vessels; specifically, an increase in sewage and fresh water tankage, as well as 30 extra passenger seats. Gladding Hearn is proud of the structural weight savings they were able to achieve to offset this extra capacity.

Principal particulars of *Seastreak Highlands* are as follows:

Length OA (excl. sponsons)	42.90 m
Length WL	37.85 m
Beam OA (excl. sponsons)	10.43 m
Beam demihull	2.75 m
Draft (approx)	1.96 m
Passengers	
Tier 1 Internal	186
Tier 2 Internal	167
Tier 3 External	30
Total	400
Main engines	4 x Cummins KTA50 M2 each 1398 kW @ 1950 rpm
Gearboxes	4 x Reintjes WVS730
Waterjets	4 x KaMeWa A50
Speed (full load)	39 kn

Port Bow of Incat Designs – Sydney's *Seastreak Highlands*

(Photo courtesy Incat Designs – Sydney)

miCat is the 167th Incat Designs – Sydney vessel to be constructed and will carry predominantly off-road vehicles to Moreton Island, Qld, from Hawkins Transport's Brisbane terminal. This vessel is a notable achievement in the way it blends modern technology with the workhorse nature of Hawkins Transport's original barge, *Moreton Venture*. The result is a vessel with the excellent seakeeping and superior interior comfort of a modern Incat Designs catamaran, a 12 m wide vehicle deck capable of carrying heavy vehicles and a bow ramp for unloading vehicles onto the beach at Moreton Island. The vessel represents a significant increase in capacity and speed for Hawkins Transport.

Principal particulars of *miCat* are as follows:

Length OA (excl. sponsons)	57.60 m
Length WL	53.40 m
Beam OA (excl. sponsons)	16.00 m
Beam demihull	5.00 m
Draft (approx)	1.75 m
Passengers	
Tier 1 Internal	313 (190 seated)
Tier 2 Internal	100 (60 seated)
Total	413 (350 seated)
Vehicles	
4WD Vehicles	49, or
6WD Trucks	10
4WD Pax Vehicles	10
Main engines	4 x Caterpillar 3412E each 537 kW @ 1800 rpm
Gearboxes	4 x Twin Disc MG5202SC
Propellers	4 x Veem 4 bladed
Speed (max dwt, 85% MCR)	16 knots

Incat Designs – Sydney's *miCat* at Moreton Island

(Photo courtesy Incat Designs – Sydney)
miCat unloading at the beach

(Photo courtesy Incat Designs – Sydney)

Around and About

As usual, February was the busiest month of the cruise-vessel season, and saw some new vessels visiting Sydney for the first time. Radisson Seven Seas' vessel, *Seven Seas Voyager*, arrived for the first time on Monday 2 February, accompanied by a spectacular water display by Sydney Ports' fire tug *Ted*

Noffs. Other first-timers included P&O Cruises' *Adonia*, and *Black Watch*, the first visit Fred Olsen Lines' vessel to visit Sydney. There were also return visits of local favourites including *QE2* on her annual circumnavigation, *Aurora*, *SuperStar Leo*, *Deutschland*, *Europa*, *Prinsendam*, and *Star Princess*. Others included *Pacific Princess*, *Pacific Sky*, *Pacific Venus*, *Astor*, and *Silver Shadow*. There were cruise vessels at one or both of Sydney's two dedicated cruise terminals (the Overseas Passenger Terminal at Circular Quay, and the Cruise Terminal at Darling Harbour) for 23 out of the 29 days of February. March and April were quieter, with visits from *Seabourn Spirit*, *Saga Rose*, and *Crystal Harmony* apart from the regulars, *Pacific Sky* and *Pacific Princess*. The only scheduled cruise vessel over the winter months is *Pacific Sky*, on serial variable-length (7 to 14 day) cruises.

Phil Helmore

Seven Seas Voyager in Sydney
(Photo John Jeremy)

Pacific Princess and *Silver Shadow* (inbound) passing on Sydney Harbour on 17 February
(Photo John Jeremy)

Queensland Industry News

Aluminium Marine is progressing with the construction of a 23 m catamaran passenger ferry for operation out of Darwin and a second 23 m cruise boat/passenger ferry. Brisbane Ship Constructions has launched three 30 m river passenger ferries for export. Trials for these vessels are planned for the first week of May.

New Wave Catamarans has won an order for a 24 m catamaran dive-charter boat and has a 19 m whale watching vessel under construction for Hervey Bay. This vessel is currently being designed by Commercial Marine Consulting Services.

South Pacific Marine is constructing a 47 m car ferry for the Bahamas that has been designed in Queensland by Sea Transport Solutions. Southern Hemisphere Shipyards has recently delivered a 47 m car ferry, also designed by Sea Transport Solutions for operation in New Zealand.

Stephen & Gravlev Marine Design have recently won a design contract for a 10 m police patrol catamaran, to be built by Yamba Welding, in NSW.

In the Gold Coast region, the marine industry is preparing for the Sanctuary Cove Boat Show. The majority of local boat builders will be contributing to the floating display. Feature displays are expected to cover everything from the large luxurious power and sailing vessels down to the family runabout. The Sanctuary Cove Boat show commences on 20 May and runs for four days. Over 380 exhibitors are expected to attend.

In the north of the state at Cairns, NQEA Australia current projects include a 63 m SOLAS passenger ship, a 35 m private motor yacht and two 22 m catamaran ferries.

Brian Robson

Navy Signs Agreement on Surface Warfare

The Australian and the United States' navies have reached an agreement that will significantly assist us in the development of our new air-warfare destroyers, Defence Minister Robert Hill announced on 27 February.

The agreement is modelled on the highly-successful 2001 Submarine Statement of Principles under which the Royal Australian Navy and the United States Navy have been helping each other to provide fully-capable, sustainable and interoperable submarine forces.

The Chief of Navy, Vice Admiral Chris Ritchie, signed the Surface Warfare Statement of Principles with his US counterpart, the Chief of Naval Operations, Admiral Vern Clark, in Washington on 27 February.

The agreement promotes cooperation between the Royal Australian Navy and the US Navy in all aspects of maritime surface warfare, including the air, surface and undersea environments.

"This Statement will serve as the framework within which the respective Navies will communicate and transfer information, helping to ensure we can better work together through compatible technologies," Senator Hill said.

"Our Navy's access to the USN provides us with significant opportunities to ensure our fleet can take full advantage of new technology and concepts.

"This will mean we will be able to benefit from the US Navy's wealth of experience in the highest-level use of the Aegis air-warfare system as we develop the requirements for our destroyers."

In particular, the Statement will:

- Provide the RAN with support on technological development and doctrine.
- Help make the technology systems of the two navies compatible.
- Encourage more joint training exercises.
- Foster more cooperation in defence science, technology and industrial relationships to enhance

the warfighting capabilities of each Navy.
- Assist with the continuing development of the air-warfare destroyer combat-system design.
- Facilitate Australian industry involvement in USN programs such as the littoral combat ship and its associated mission modules.

"The Statement will promote opportunities for Australian industry at a time when almost all of the RAN's surface fleet is being renewed as we pursue the strategic capabilities set out in the new Defence Capability Plan," Senator Hill said.

"Major projects include the acquisition of three state-of-the-art air-warfare destroyers, the integration of the Standard Missile-2 into the Adelaide-class guided-missile frigates and the introduction of the enhanced Harpoon Block II anti-ship missile into the fleet."

The Surface Warfare Statement builds on the success of the Submarine Statement that has seen the two navies develop joint projects for the replacement combat system and new torpedo for the Collins-class submarines.

Spirit of Ontario I Starts Service

A new era in North American transportation has arrived on Lake Ontario in the form of the Auto Express 86 catamaran *Spirit of Ontario I*, the latest passenger and vehicle fast ferry from Australian shipbuilder Austal Ships.

Spirit of Ontario II
(Photo courtesy Austal Ships)

The stylish ship, the first vehicle-passenger ferry Austal has completed for the North American market, arrived at Rochester, New York, on 27 April. The project is the result of several years' work by US company Canadian American Transportation Systems (CATS) to improve links between the two regions which have, until now, been without a ferry crossing.

The most direct line between Rochester, New York, and Toronto, Ontario, is the 82 n mile path across the open waters of Lake Ontario, a journey which takes only two hours and 15 minutes for the fast ferry. In comparison, the 275 km drive around the western end of the lake takes at least three hours, even in perfect road and traffic conditions. However, weather and traffic congestion, particularly at the border crossings, can stretch the travel time to four hours or more. The 86 m catamaran will, therefore, clearly provide a traveling option that is not only faster but also more relaxing and comfortable.

En route to its new home port, *Spirit of Ontario I* made promotional visits to Hawaii and New York City where it was received with enormous interest. The presence of the vessel made a very high-profile public statement highlighting the potential for expanded use of fast ferries in the North American market.

Spirit of Ontario I has been purpose designed with a maximum beam of 23.8 m, to enable her to fit through the canals on the St Lawrence Seaway. Other changes include structural, design and equipment modifications in accordance with the latest IMO HSC Code 2000 requirements and to allow operation in limited ice conditions. The latter has been achieved by increasing shell plating thickness over the classification requirement. The vessel has also been completed to meet the latest security requirements of the United States Coast Guard and Department of Homeland Security.

During sea trials the ferry exceeded the contractual speed requirement of 42 knots by three knots and reached a top speed of 47.2 knots, making it the fastest car ferry ever built by Austal.

The ship is powered by four MTU 20V 8000 M70 diesel engines, each providing a maximum power output of 8200 kW at 1150 rpm and making it the most powerful diesel-engined fast catamaran in the world. Each engine drives a Lips LJ120E waterjet through a ZF 53000 gearbox.

Spirit of Ontario I will provide facilities and ambience worthy of a small cruise liner. High-quality materials and fittings are used throughout the vessel, ensuring pleasant surroundings for all passengers, and durability and ease of maintenance for the operator.

Extra-wide seating has been provided for 774 passengers, including seating for 78 business-class passengers on the starboard side of the bridge-deck lounge. Foot passengers embark via doors amidships on the upper deck and enter a spacious atrium that includes lounge seating, a passenger information desk and a duty-free shop. Attractive yet practical Amtico flooring is a feature of this high-traffic area, as is the central double staircase that leads to the bridge deck and draws the eye to a domed skylight that fills the space with natural light.

The main lounge in *Spirit of Ontario I*
(Photo courtesy Austal Ships)

Behind the duty-free shop is an amenities block and a bar/servery facing the aft passenger cabin. This area features a combination of lounge and reclining seats arranged around tables enabling passengers to enjoy their refreshments in maximum comfort.

The starboard aft quarter is the designated Children's Corner, where younger travelers can while away the passage on a voyage of discovery in colourful surroundings. The corresponding position on the port side is a games arcade, adjacent to which is a lift providing wheelchair access to and from the vehicle deck in accordance with US ADA requirements. Staircases forward and aft on each side also link the upper deck with the vehicle deck.

Located on either side of the central amenities block are two cinemas, each seating 46 passengers. A gently-sloping deck ensures that movie fans enjoy clear viewing from all seats. Passengers in other areas are entertained and informed via an integrated public-address and audio-entertainment system. The ship's video-distribution system is linked to colour television monitors that have been located throughout the vessel.

The cabin section forward of the atrium is divided into three areas. Seating in the outboard areas consists of reclining seats arranged in rows of two, while the central buffet area is laid out with a table-and-chair arrangement to reflect the adjacent servery, from which passengers may purchase hot and cold food and beverages. Immediately forward of the servery is a well-equipped galley and catering area.

The forward observation lounge, tastefully decorated in gentle creams and blues, is sure to be a hit with passengers, offering, as it does, breathtaking views of Lake Ontario.

Business-class passengers in the spacious Business Centre, located in the bridge-deck lounge, may access the internet on their laptops, or simply relax in comfortable reclining seats in an informal yet sophisticated atmosphere. A bar on the centreline immediately aft of the bridge provides a dedicated drinks service.

Located between the bridge-deck lounge and the wheelhouse are crew amenities including a crew shower/change room which includes a toilet and crew lockers.

Arranged for a three person bridge team, the wheelhouse is fitted with, among other items, external communications equipment complying with GMDSS requirements; CCTV monitors at the Master's, Chief Officer's and Engineer's positions; inter-switched X and S band ARPA radars; ECDIS; DGPS receiver; night vision; speed log; wind instruments; autopilot; gyro and magnetic compasses and an echo sounder. Austal's machinery and control monitoring system, Marine Link, is fitted, bringing engines, gearboxes and propulsion under centralised control and monitoring. Steering can be carried out using levers mounted on either the Master's or Chief Officer's chairs, or from the bridge-wing stations designed for maximum vision when berthing and manoeuvring.

On the vehicle deck, *Spirit of Ontario I* has been configured to carry trucks as well as cars. Featuring bow and stern doors for a fast and efficient drive-through operation, the vehicle space is fitted with a hoistable mezzanine deck. With this raised, 10 trucks may be carried in the two central lanes, which are strengthened for axle loads of up to 15 t. When the deck is lowered, a total of 243 cars can be carried.

Principal Particulars

Length overall	86.6 m
Length waterline	74.15 m
Beam moulded	23.8 m
Hull depth moulded	7.6 m
Hull draft (maximum)	3.4 m
Deadweight (maximum)	470 t
Crew	26
Passengers	774
Vehicles	238 cars, or 10 trucks and 150 cars
Axle loads	15.0/12.0 t (dual/single axles) on central lanes 3.5 t on outboard lanes 1.0 t on mezzanine lanes
Vehicle deck clear height	4.2 m
Fuel (maximum)	160 000 L

Propulsion

Engines	4 x MTU 20V 8000 M70 8200 kW at 1150 rpm each
Gearboxes	4 x ZF 53000
Waterjets	4 x Lips LJ120E
Speed:	45 kn at 100% MCR with 308 t dwt

Survey

Classification	Germanischer Lloyd ƒÈ 100A5 HSC-B OC3

Boost for the RAN's Fleet Information Systems

The Royal Australian Navy will take a significant step towards a network-centric warfare capability after the Government approved a $45 million upgrade to shipborne information systems. Commodore Peter Jones, RAN, said on 4 May the money would be spent upgrading the information technology systems of four FFGs, the eight Anzac frigates and the support ships *Kanimbla*, *Manoora* and *Success*.

"This will allow deployed ships to establish computer-based wide-area networks at sea, allowing Navy to rapidly move information around its fleets at sea and communicate with headquarters and allies," Commodore Jones said.

"This new project will significantly increase the ability of Navy ships to exchange and process information quickly and is a response to the increased tempo of modern military operations."

Navy ships are already being fitted with systems that will provide ships with improved access to both satellite and modern high-frequency communications. However, the Navy's capacity to handle electronic information on board ships and to rapidly transfer information between ships of a fleet needs to be updated to match the capacity of these modern communication systems.

Commodore Jones said that the project will greatly improve the ability of ships and shore establishments to communicate via email, a factor that will significantly improve the quality of life for sailors serving on board ships, by enabling them to have more-frequent contact with their families.

The networking capabilities provided under the project will also enable more effective use of command and control systems and faster decision making by the ship's commanders — improving both the combat power of individual ships and the Royal Australian Navy as a whole.

EDUCATION NEWS

The University of New South Wales

Undergraduate News

Student-staff Get-together

The naval architecture students and staff held a get-together on Thursday 19 March. 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 and soft-drink were provided and, after a slow start, conversation was flowing pretty freely an hour later! This year we have about twelve students in first year (our largest number ever), eight in second year, fifteen in third year and about fourteen in fourth year (several doing split programs, and three exchange students from Norway), and two post-graduates, many of whom attended. All the full-time staff attended, along with invited lecturer Graham Taylor and our honorary naval architects, Tracie Barber and Robin Ford. A broad mix, and some wide-ranging discussions ensued.

Launching of HMAS *Perth*

The Anzac Ship Project Management Office was a generous host to our final-year students accompanied by lecturer Mr Phil Helmore, and to the AMC final-year students accompanied by lecturer Mr Giles Thomas. This enabled them to see the launching of the tenth Anzac-class frigate, HMAS *Perth*, at Tenix Defence Systems' construction facility at Williamstown. On Friday 19 March, the day before the launching, Ship Construction Engineer Ms Sam Tait welcomed students from UNSW and AMC to the yard and made the Introduction to Safety presentation. The Dockmaster, Mr Saeed Roshan-Zamir, and Ms Tait then led them on a tour of inspection of the ways where preparations for launching were in progress. Mr Albert Mangione then made a presentation on the modular construction of the vessels, the contractual arrangements (including myriad changes, both small and large), quality management and logistics for the project.

The Anzac ship is constructed in twelve major modules, six for the hull and six for the superstructure. These are fitted out to varying levels prior to erection and consolidation on the building berth. The superstructures and some hull modules for HMAS *Perth* were built at Whangarei, NZ, and the remainder completed at Williamstown.

Mr Mangione and Ms Tait continued with a tour of the Tenix construction facility, showing where all the action *had* happened, from plate entering the facility, cutting, welding into sections, units, and modules; and concluded with a tour of the dry dock and the berths where HMAS *Ballarat* was almost due for hand-over to the RAN, and HMAS *Toowoomba* is mid-way through fit-out. After lunch, they returned to the launching ways to see a trial run of the champagne bottle and the complete trigger release, both of which worked flawlessly. Ms Tait then made a presentation on the launching drawings, arrangements and calculations.

The launch lady for HMAS *Perth*, on Saturday 20 March, was Ms Margaret Gee, whose father, Able Seaman First Class Allan (Elmo) Gee, was the helmsman and Captain's bugler when the first HMAS *Perth* fought her last battle. He survived her sinking and three-and-a-half years as a prisoner-of-war, including two years on the infamous Thailand–Burma railway. Visiting dignitaries included Mr Robert Salteri, CEO of Tenix Defence, Mr Paul Salteri, Group MD of Tenix, Vice-Admiral Chris Ritchie, Chief of Navy, The Hon. John Thwaites MP, Deputy Premier of Victoria, and Senator the Hon. Robert Hill, Minister for Defence. Music was provided by the Royal Australian Navy Band, the Australian Children's Choir, who sang *A Sea Change* and Eric Bogle's *Shelter*, and the beautiful, soaring voice of Able Seaman Musician Tracie Burke, leading the assembly in *Advance Australia Fair* and *The Naval Hymn.* A number of officers and crew of the two previous HMA Ships *Perth*, and other retired RAN personnel, were there for the occasion.

A minor technical hitch occurred when the champagne bottle failed to break on the stem when released by the launch lady, despite successful trials the day before. The ribbon was retrieved, the bottle hauled higher, and champagne flowed happily. The subsequent launching of HMAS *Perth* was textbook-smooth and a credit to all concerned.

The champagne bottle being re-hoisted
(Photo John Jeremy)

The launch was followed by a fly-past by a restored WWII Australian designed and built Boomerang fighter aircraft, and by Super Seasprite (as carried by the Anzac-class vessels) and Seahawk helicopters.

Crews from UNSW and AMC in the Anzac SPMO conference room
(Photo courtesy Giles Thomas)

UNSW would like to thank Mr Owen Liddicoat, Anzac Ship Project Manager, for making the visit possible, Mr Saeed Roshan-Zamir, Mr Albert Mangione and, especially, Ms Sam Tait, for their parts in making our visit interesting, informative and entertaining.

HMAS *Perth* hits the water
(Photo Phil Helmore)

Graduation

At the graduation ceremony on 29 April, the following graduated with degrees in naval architecture:

Graeme Collins	H2/2
Peter Holmes	H1
Tony Sammel	H1 and University Medal
Cengizhan Uluduz	H2/1

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

The performance of Tony Sammel deserves special mention. The University Medal is awarded for the highest average mark for all courses in all years of the degree plan (weighted more heavily towards the later years) of 85% or more. To put this in perspective, of our 269 graduates in naval architecture, fifty-one have been awarded Honours Class 1 (for a weighted average of 75% or more), and just six have been awarded the University Medal: Tony Sammel (2004), Nigel Lynch (2003), Michael Andrewartha (2000), Steve Davies (1980), Brian Morley (1974) and Phil Helmore (1970).

Prize-giving

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 Sean Cribb.

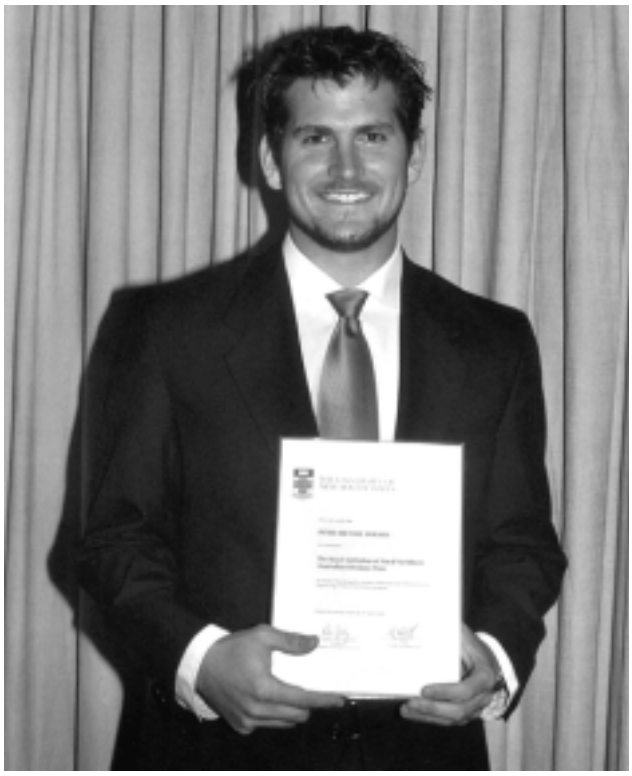
The Baird Publications Prize 2 for the best performance in Ship Structures 1 jointly to Anthony Brann and Sean Cribb.

Tony Sammel, Peter Holmes and Cengizhan Uluduz
at UNSW Graduation Ceremony on 29 April
(Photo courtesy Cengizhan Uluduz)

The Royal Institution of Naval Architects (Australian Division) Prize for the best ship design project by a student in the final year to Peter Holmes for his design of a tug for Australian port operations, with 50 t bollard-pull for handling tankers up to 125 000 tdw, and occasional offshore towing or salvage operations.

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

Congratulations to all on their fine performances.



Peter Holmes with the RINA (Australian Division) Prize Certificate
(Photo Phil Helmore)

Tony Sammel and the David Carment Memorial Prize Certificate
(Photo Phil Helmore)

Employment

Our 2004 graduates are now employed as follows:

Graeme Collins	World tour and fact-finding mission
Peter Holmes	Deckhand/cook on charter cat, Whitsundays
Tony Sammel	Booz Allen Hamilton (Australia), Sydney
Cengizhan Uluduz	R&R Watercraft, Sydney

Post-graduate and Other News

Graduation

At the graduation ceremony on 29 April, Evan Spong was awarded his PhD degree *in absentia* for his thesis *A Numerical Simulation of Adaptive Electromagnetic Flow Control*. Congratulations, Evan!

Nineteenth IWWWFB

The prestigious yearly International Workshop on Water Waves and Floating Bodies, the nineteenth in the series, took place on this occasion in Cortona, Italy, on 28–31 March 2004. A total of 59 papers was presented at the 19IWWWFB on all topics associated with water waves, with a good number of papers devoted to the matter of waves generated by ships and the impact of waves upon ships. There were 79 attendees.

Two Australian contributions were made. The first, by Professor Lawrence Doctors from UNSW and Professor Gregory Zilman of Tel-Aviv University, was on the topic, *The Influence of Surface Tension and Viscosity on the Wavemaking of a Model Catamaran*. In that paper, Lawry reported on an extensive set of experiments conducted in the Model Basin at the AMC, in which the influences of catamaran demihull spacing, water depth and model speed were all studied. It was shown that excellent agreement for the wave profiles and the root-mean-square wave elevation, between the model experiments and the computer program, could be achieved. It was also demonstrated that the surface tension of the water, now incorporated in the computer program, plays a significant role in such tests at low Froude numbers for small models possessing a length of only one or two metres.

The second Australian contribution was by Professor Ernie Tuck and Mr Leo Lazauskas of Adelaide University. The title of their paper was *Lifting Surfaces with Circular Planforms*. The purpose of the reported research was to develop more-accurate methods of predicting the lift of unusually-shaped wings.

Readers of *The ANA* will be interested to learn, also, that Cortona is on the site of the ancient Kurtun, one of 12 Etruscan city-states established before the common era. This mysterious people developed an alphabet that was midway between Phoenician and Greek. Their language has not yet been completely deciphered.

Design and Operation of Trimaran Ships

The conference on this very specific type of unconventional ship took place in London on 29–30 April 2004, under the auspices of RINA in association with the Ministry of Defence Sea Technology Group. It follows a similar conference, the International Symposium on RV *Triton*: Trimaran Demonstrator Project, organized by RINA in April 2000, which was also held in London.

The current interest in trimarans is based on the notion that the concept is really a "stabilized monohull". That is, a small fraction of the overall buoyancy is contained in the side hulls. This idea follows the line of reasoning that a high-speed vessel should be slender in order to miminise the wave resistance. As a consequence, the wetted surface becomes a dominating factor; this mitigates against catamarans and traditional trimarans. Thus, a careful selection of the geometric proportions of the trimaran can lead to a vessel with an improved resistance curve. A bonus is that the trimaran provides a good physical layout with better prospects for arranging the cargo and/or payload.

There were 23 papers presented at the conference. The principal topics were seakeeping, structures, classification, operation, design, development, and powering. While most presenters were from the UK, a number of persons travelled from the US, France, Netherlands, Germany, Korea, and Australia. Indeed, the largest overseas contingent was from the latter country. The three Australian papers were:

Mr Robert Tulk and Mr Steven Quigley of North West Bay Ships presented *Development of the North West Bay Ships Trimaran*. The paper centred on MV *Triumphant*, a 55 m trimaran fast passenger vessel, launched in 2001. This craft is currently operating between Korea and Japan. Further developments along these lines, including a luxury motor yacht, currently under construction, were also described.

Dr Tony Armstrong of Austal Ships presented *Coming Soon*

to a Port Near You — the 126 m Austal Trimaran: This paper referred to the practical design of a 126 m, 40 kn aluminium fast ferry, presently under construction in Australia. This vessel is due for delivery in December 2004. The differences between this vessel and RV *Triton* were outlined.

Professor Lawry Doctors of The University of New South Wales, and Mr Robert Scrace of QinetiQ, Haslar, UK, presented *Hydrodynamic Interactions between the Subhulls of a Trimaran during Rolling Motion*. The subject of this research was the wave generation by the three subhulls of a trimaran and how they interact in order to affect the rolling motion of a vessel. Good correlation of the theoretical predictions with experimental data for heave, pitch, and roll was demonstrated.

A total of 102 attendees from 14 countries was present, making this a most successful conference organised by the head office of RINA in London.

Phil Helmore
Lawry Doctors

Curtin University

Research

The Centre for Marine Science and Technology has been busy with research over the summer. Kim Klaka submitted his PhD dissertation, entitled *Roll Response of a Yacht at Zero Froude Number*, and has since sent associated articles to RINA's *International Journal of Small Craft Technology* and SNAME's *Marine Technology*. Tim Gourlay travelled to the Australian Maritime College to complete a study into bores produced between catamaran hulls, together with Jonathan Duffy from AMC and Andrew Forbes from WaveMaster. Their paper has been submitted to RINA's *International Journal of Maritime Engineering*. Tim has also written articles on *Flow beneath a Ship at Small Underkeel Clearance* and *A Simple Method for Predicting the Squat of a High-speed Ship*, as well as recent work on deep-water wave patterns and squat of catamarans.

CMST has recently put in a proposal for Australian Research Council funding to study "compliant surfaces" (soft surfaces such as dolphin skin, which reduce turbulence in the boundary layer) for reducing the drag of ships.

Teaching and project supervision

CMST will again be running the subject Applied Hydrodynamics in second semester. This is a practical look at the topics of boundary layers, turbulence, separation, drag, cavitation, lift of foils etc., suitable for naval architects as well as undergraduate students. Please contact Ann Smith in the office on 9266 7380 if you are interested in attending.

Final-year physics or engineering projects supervised through CMST this year include:

- Flow visualization around a yacht keel rolling at zero speed,
- Swimming motion of trolling lures,
- Effect of roll reduction on heave and pitch of a monohull, and
- Effect of bowfins on reducing pitching of trawlers (together with AMC)

Consulting work

Recent projects include an investigation into container offloading (together with AMC Search); upgrading SailTool (CMST's sail shape analysis package); calculating the shape of a hydrophone array towed by a submarine for DSTO; and various underkeel-clearance work.

Cooperation with Australian Maritime College

CMST and AMC have held a long tradition of cooperation, through the CRC in the 1990s, and less formally on a range of research and commercial work right up to the present. In recognition of this, a Memorandum of Understanding is being developed between the two institutions, stressing cooperation in research, teaching and commercial work. The naval architecture strengths of each institution are quite complementary, with CMST's experience in full-scale testing and AMC's experience in model testing being one such example. It is hoped that the association will help in gaining government research grants and larger contracts, and provide a significant base of expertise for consulting to Australian industry as well as overseas.

Tim Gourlay

Australian Maritime College

Ocean Vehicle Design Projects

The final year BEng (Naval Architecture) subject Ocean Vehicle Design has developed a greater industry focus this year. Students, who are working in small teams, have been provided with design briefs from industry representatives. The briefs include a patrol boat from Austal Ships, a passenger/car ferry from Crowther Design, a multi-role fast vessel from the Department of Defence, a search-and-rescue vessel from Tenix Defence (WA) and an offshore support vessel from Sinclair Knight Mertz. The industry "clients" have also provided significant and beneficial feedback on the students' designs as they progress.

In addition, external lecturers have presented students with valuable insights into the design process. These lectures, which have also run as RINA seminars under the Tasmanian Section, have included:

- Robin Gehling (Principal Adviser — Technical, AMSA) on *Regulatory Constraints on Ship Design*.
- Magnus Lindgren (Head of Approval Centre Sydney, DNV) on *The role of Classification Societies in Ship Design*.
- Gordon MacDonald (Director Navy Platform Systems, Department of Defence) on *The Systems Engineering Approach to Ship Design*.
- Stuart Cannon (Maritime Platforms Division, DSTO) on *Structural Integrity of Warships*.

AMC Students and Staff Attend the Launch of the last Anzac-class Frigate

Giles Thomas and four BEng (Naval Architecture) students visited Tenix Defence's Williamstown dockyard on Friday 19 March. They were shown around the yard by AMC graduate Samantha Tait who is the Ship Construction Manager for the Department of Defence. As well as seeing the construction facilities, they had a close look at the launching preparations for the last of the Anzac-class frigates,

Perth. The group were invited back to view the launch from the VIP enclosure on the following day. Apart from two attempts being required to smash the bottle of champagne, the launch went very smoothly.

Visitor to AMC from Chile

Professor Marcos Salas of the University of Austral, Chile, visited AMC in February. While here he delivered two lectures to staff and students entitled *Stern Flap Performance on the Resistance Optimisation of a Semi-displacement Hull* and *The Role of Naval Architects in the Development of the Fish-farming Industry in Chile*. Professor Salas also had extensive discussions with AMC staff regarding collaborative research work and made arrangements for some of his students to spend up to three months of internship at AMC as part of their research project work. A Memorandum of Understanding was also signed to facilitate the exchange of students and staff.

Industry Sponsorship of PhD Student

Two composite industries, DIAB Australia and Fibre Glass International, have jointly offered a research scholarship to support Roberto Ojeda's PhD studies under the direct supervision of Dr Gangadhara Prusty. Roberto's research will focus on presenting a finite element formulation and experimental investigation of stiffened composite and sandwich structures under various load cases.

Roberto returns to AMC after completing his naval architecture degree at the University of Austral in Chile. He previously spent a year at AMC as a recipient of the Tom Fink Scholarship to undertake his final-year research thesis on the finite element analysis of a composite catamaran under slamming loads.

New Hydrodynamics Software

The French classification society, Bureau Veritas, has recently provided AMC with an advanced hydrodynamics software package, *HydroStar*. The software package handles linear and non-linear wave effects and motions of ships and offshore platforms, and enhances AMC's computational marine hydrodynamics capacity. It will be immediately employed in some of our ongoing research projects and will provide a solid platform for dealing with dynamic underkeel clearance and wave effects on ship manoeuvring, for example. A range of other collaborative opportunities are also under discussion with Bureau Veritas.

The 5th International Conference on Coastal Environment

Gregor Macfarlane (AMC) and Greg Cox (Kamira Holdings Pty Ltd) co-authored a paper for presentation at the 5th International Conference on Coastal Environment (Environmental Problems in Coastal Regions) held in Alicante, Spain, in late April 2004. The paper, titled *The development of vessel wave wake criteria for the Noosa and Brisbane Rivers in Southeast Queensland* discussed some aspects of a project undertaken by the authors over the past few years.

The work developed after several rivers in Queensland experienced notable bank-erosion problems. Public concern compelled the relevant authorities to commission a series of inter-related studies to determine the extent of the erosion, its probable causes and a means of quantifying the erosion potential of vessel wash.

Sections of the Noosa River are in pristine condition, suffering little or no anthropogenic impact. However, one reach of the river is used by recreational and small commercial vessels as a transit route between two large lakes (Cootharaba and Cooroibah) and is often traversed at high speed. The Brisbane River is also used for recreational boating, but the river has undergone significant change since European settlement almost 200 years ago.

The Australian Maritime College conducted field tests to measure the wave wakes of a variety of craft that frequent these rivers. The wakes were analysed for certain maximum values such as wave height, wave period and wave energy, as well as total wake trace energy. Previous experiments attempting to correlate erosion thresholds against wake parameters were re-analysed and applied to the Noosa and Brisbane Rivers. Vessel operating criteria were developed for each river in terms of the energy of the maximum wave, maximum permitted waterline length (which can characterise wave period) and vessel speed. It is proposed that multiple criteria provide a better indicator of erosion potential than traditional single indicators, such as wave height.

Research into Bore Waves Produced Between Catamaran Hulls

In February, a series of ship model experiments were conducted within the Model Test Basin at AMC as part of a study into bores produced between catamaran hulls. This study is being conducted by Jonathan Duffy from AMC, Tim Gourlay from CMST at Curtin University and Andrew Forbes from WaveMaster International. The team have submitted a paper titled *The Bore Produced Between the Hulls of a High-Speed Catamaran in Shallow Water* to RINA's *International Journal of Maritime Engineering*. This work follows on from some interesting results found during some earlier experiments conducted as part of Andrew's final-year research thesis at AMC in 2002.

Gregor Macfarlane

A NOTE TO CONTRIBUTORS

Whilst all contributions to *The Australian Naval Architect* are very welcome, the Editors' hearts warm to those contributors who provide material in a format that requires little work to prepare for layout. *The ANA* is built (once a shipbuilder, always a shipbuilder) in Pagemaker v.6.5 running under Windows. Articles should be sent as Word documents or text files with a minimum of formatting. Illustrations should never be sent in Word files, but as separate attachments in JPG, TIF, EPS or WMF format. A resolution of 200-300 dpi is preferred. If in any doubt, an email to the Editor will sort out potential problems.

FROM THE CROW'S NEST

Lloyd's Register Launches SeeThreat

The Lloyd's Register Group is launching SeeThreat, a powerful new web-based risk-assessment tool which helps ship operators and their company security officers (CSO) to assess the security threat to their ships.

The International Ship and Port Facility Security (ISPS) Code becomes mandatory on 1 July 2004. Pressure is building to demonstrate compliance, and only some 3% of ships are currently certified. The Code requires CSOs to use their security assessments and "other information" as the basis for advising their ships about the threat levels they may encounter, such as terrorism, piracy, labour disputes and civil unrest, among others. SeeThreat assists informed critical security decision making by presenting the results of daily, historic and global information news feeds relevant to the ship at its operating locations in an easily-interpretable format.

SeeThreat has been developed in collaboration with QinetiQ, one of Europe's largest science and technology companies, and is accessed through the Lloyd's Register Group's award-winning internet information service ClassDirect Live (www.cdlivelr.org). SeeThreat uses proven search-engine technology originally developed by QinetiQ to meet the security needs of the UK government.

David Moorhouse, Executive Chairman of the Lloyd's Register Group says: "Together, the Lloyd's Register Group and QinetiQ create a world-beating combination in the field of maritime security. Through SeeThreat we have achieved the same standard for the essential task of providing critical information tailored to suit the requirements of company security officers and the ISPS Code. I am confident that SeeThreat will bring considerable benefit to our customers through the elimination of the time-consuming task of data gathering and dissemination."

SeeThreat constantly monitors maritime security news information for locations and threats specified by the operator to meet its own needs and the relevant ISPS Code threat levels. Rising threats are presented graphically at chosen locations and levels, and are displayed by amber/yellow and red warning icons.

According to Paul Lightburn, the Lloyd's Register Group's Product Manager, SeeThreat provides owners and operators with a user-friendly and cost-effective way of not only complying with the "additional information" clause of the ISPS Code, but also of quickly assessing the level of risk faced by their vessels. "Recognised security organisations and flag-state officers will be looking for evidence that CSOs have identified potential threats and their significance," he points out.

SeeThreat will be available on annual subscription through www.cdlive.lr.org or by emailing seethreat@lr.org or cdlive@lr.org.

Maxsurf Upgrade

Maxsurf, the well-established suite of hull-design software from Formation Design Systems, has recently been upgraded to Version 10. The upgrade adds a number of enhancements, including more stability criteria and analysis options, user interface improvements, an expanded structural shape library and a new method for resistance prediction.

Hydromax now includes limiting KG and KN analyses in batch processing, and the analysis is carried out for all damage cases. It is now possible to choose the type of free-surface moment correction to be applied: actual or maximum FSM, IMO FSM, or a user-specified constant FSM, or to use the actual shift of fluid due to heel and trim. The US Coast Guard stability criteria are now included.

A number of features have been added to all graphs in the suite, including the abilities to print the graph to scale and to directly access the graphed data in numerical form for copying and pasting into other programs.

Productivity features include enhancements for quicker navigations through the sections in the body-plan view, easier selection of surface edges, and additional toolbar buttons.

Workshop now includes a comprehensive library of marine stiffener sections and appropriate cutouts. These include both rolled and extruded shapes covering typical sections used in steel displacement vessels and high-speed aluminium craft. The link with ShipConstructor has been enhanced with the addition of the export of plate meshes .

Hullspeed has been enhanced by the addition of a slender-body monohull resistance prediction method. This is based on Couser, P., Wellcome, J. F and Molland, A. F., An Improved Method for the Theoretical Prediction of the Wave-making Resistance of Transom-stern Hulls using a Slender-body Approach, *International Shipbuilding Progress*, v.45 n.444, 1998 for the prediction of wave resistance. The viscous resistance component is calculated using the ITTC '57 ship-model correlation line and the Hottrop and Mennen form factor.

For further information, contact Formation Design Systems on (08) 9335 1522 or email info@formsys.com.

Multiframe Upgrade

Multiframe, the well-established suite of structural software from Formation Design Systems, has recently been upgraded to Version 8.6. The upgrade adds a number of enhancements, including user-defined grouping, enhanced 3D drawing including structural grids, automatic colour legends based on member type or grouping, participation factors, spring elements, and steel design and optimisation to BS5950.

It is often convenient to be able to group together a number of members for the purposes of selection, drawing colour or visibility. Mulitframe now allows the grouping of members by the user, and allows the creation of different sets of groups so that it is easy to group members in more than one way.

Multiframe has always allowed quick sketching of structures, including automatic snapping to a regular grid. These commands have now been extended to allow sketching in 3D, automatic snapping to element mid and quarter points, and to multiple structural grid lines.

The automatic assignment of colours to structural members has now been added. The legend can be customised to

automatically assign colours based on section type, group or shape, or member label, type or group.

The generation of common structural forms (e.g. trusses, portal frames and grillages) has been significantly improved. Open GL rendering has been enhanced to allow the user to select the level of detail to which section shapes are represented (low/medium/high). The speed of analysis has been significantly increased by optimising the order of member loads, leading to a reduction in analysis times of up to 75% for some large frames. Spring elements between nodes, to simulate the stiffness of some part of the structure that it is not appropriate to model as a member, have now been added. Steel Designer has also been enhanced, principally by support of design to BS5950, the standard for steel structures in Britain but also widely used in south-east Asia. A large number of new commands simplify the drawing of complex section shapes.

For further information, contact Formation Design Systems on (08) 9335 1522 or email info@formsys.com.

Baird Publications Launches MEPS Database on CD

Baird Publications has for many years been compiling and publishing *Marine Engines and Propulsion Systems*, a database in book format containing the products of all known manufacturers in the marine industry. They have now released the database in digital format on CD to allow users to compare on screen, for example, the shaft power from different engines or the reduction ratios of different gearboxes. The database is arranged on the CD in an easy-to-navigate arrangement which allows users to quickly locate products that meet their needs, whether for diesels, gas turbines, petrol engines, gensets, gearboxes, propellers, thrusters, waterjets, or any other form of marine engine or propulsion system. It allows users to find exactly what they want without having to search manually through many records to find a product that meets their requirements. Full address and contact details for all companies with products in the database are provided. The database was launched at the Gulf Maritime Exhibition held in Sharjah, UAE, in April. For further information, contact Baird Publications on (02) 9645 0411, email marinfo@baird.com.au or visit their website, www.baird.com.au.

Phil Helmore

THE INTERNET

Ellen MacArthur Under Way Again

Following the launch of her new 23 m composite trimaran, *B&Q*, built by Boatspeed at Somersby, NSW, Ellen MacArthur had successful sailing trials and rig tuning using Sydney as a base. She then sailed from Sydney with Loik Gallon and Mark Thomas on the vessel's maiden voyage and shakedown via Auckland, NZ, to Port Stanley, Falkland Is. From there she sailed on alone to Newport, Rhode Island, USA. She expects to attempt the record for a west–east trans-Atlantic solo crossing during May, the current record of just over seven days being held by Laurent Bourgnon. For up-to-the minute details, see the Team Kingfisher website, www.teamkingfisher.com/uk.

Phil Helmore

Surfing the 'Net

I was doing some surfing on the 'net recently and came across the website www.bodrum-bodrum.com/vorteks/arsenal which styles itself as the Virtual Marine Arsenal. There are numerous drop-down menus which list all the naval and aero CFD codes and other naval architecture software programs available, with a brief summary of each and a link to the relevant websites of the code and software developers, all of which I found interesting. There is also information on the stealth bomber and the 50 m seagoing stealth craft. There is also a lot of ship drawings (mainly historical), online calculators, technical papers, etc. The technical papers led me to the following:

The MARNET-CFD website https://pronet.wsatkins.co.uk/marnet/ includes numerous papers on CFD application in naval architecture, papers from their workshop proceedings, best practice guideline, databases and demonstrations.

The website for the Gothenburg 2000 workshop on CFD in Ship Hydrodynamics is located at www.iihr.uiowa.edu/gothenburg2000/.

One real gem was the link to www.shipmotions.nl, which is the personal website of Johan Journee, Associate Professor of hydrodynamics at the Delft University of Technology. He is now semi-retired but is still actively refining his software programs and lecture notes. I think he attended STAB 2000 in Launceston. From his personal website there is a link to his website at the university, www.ocp.tudelft.nl/mt/journee/ from where you can download any of the forty-plus papers he has presented, lecture notes on hydrodynamics (and associated questions and answers), software on propeller design, resistance software (Holtrop) and air resistance (Isherwood) that he has developed, and much more including links to educational material on hydrodynamics and aeronautics.

Graham Taylor

The Royal Navy Trafalgar-class attack submarine HMS *Tireless* sits on the surface at the North Pole on 19 April. *Tireless* surfaced with the US Navy Los Angeles-class attack submarine USS *Hampton* (SSN 767) for ICEX 04, a joint operational exercise beneath the polar ice cap.
(US Navy Photo by Kevin Elliott)

Sailing Records Tumble

New Round-the-world Record

Cheyenne, ex *PlayStation*, has set a new round-the-world record of 58d 9h 32m 45s, eclipsing the previous record of 64d 8h 37m 45s set in 2002 by Bruno Peyron on the French catamaran *Orange*. The new record entailed a 25 744 n mile run around the planet at an average speed of 18.37 knots. This speed is not significantly faster than the old record speed of 18.15 knots, but was achieved by sailing a course much closer to the rhumb-line.

Steve Fossett, with a crew of 12 on *Cheyenne*, set off from the Ushant start line in early February with a reasonably slow run down the Atlantic to the southern ocean. The team then piled on the speed, covering 12 606 n miles in the 25 days following day 12, at an average speed of 21.01 knots. The trip was not entirely incident free, with gear, rig and structural issues, including a separated forestay, shorted-out instrumentation, a broken mast track and, in the last week of sailing, a disintegrating forward-beam connection at the starboard hull.

Cheyenne at Speed
(Photo Claire Bailey)

The record, although ratified by the WSSRC, cannot claim the Jules Verne Trophy, as the entry fee was not paid to the Jules Verne Committee.

Bruno Peyron, the previous record holder, has now taken delivery of his new boat *Orange II*, which is a second-generation maxi-multihull from the design/build team of Giles Ollier and Multiplast Yachts. The new vessel represents a refinement in thinking about the most efficient way of getting around the planet. *Cheyenne* had 16 days of runs under 400 n miles, including 9 days of runs under 300 n miles. The new *Orange II* is designed with light airs and upwind work in mind, in the hope of eliminating these slower days which are most often encountered around the convergence zones of the mid-Atlantic. Much work has been done in reducing drag due to wetted surface, crossbeam slamming, and induced drag from pitch and heave motions. Compared to the previous-generation boats (including the original *Orange*), *Orange II* is longer, finer in the hulls, higher in freeboard of hulls and crossbeams, and with considerably more power in the sail plan, coupled with a significant increase in righting moment to handle the extra power. Designer Ollier still believes that an 18 kn average around the world is below what the new generation of maxi-multihulls should be capable of.

Mari Cha IV at Speed
(Photo Thierry Martinez)

The super-maxi arena is definitely getting interesting. The new super-maxi schooner *Mari Cha IV* will be waiting in the wings for an attempt on the Jules Verne trophy. She recently demolished the transatlantic monohull record on her first outing, dropping the 8d 20h 55m 35s mark to 6d 17h 52m 39s at an average speed of 19.5 kn. In doing so, she also captured the monohull 24 hour speed record with a run of 525.5 n miles. *Mari Cha IV* seemed to stroll across the Atlantic, reeling off a series of 500 n mile days, with the

Principal particulars of the protagonists

	Cheyenne	*Orange II*	*Mari Cha IV*
Type	Catamaran	Catamaran	Monohull
Length OA	38.1 m	37.8 m	44.4 m
Length hull	38.1 m	36.8 m	42.6 m
Beam	18.3 m	18 m	9.6 m
Draft	4.5 m (boards down)	4 m (boards down)	6.5 m (keel down)
Displacement:		25 t	50 t
Sail area (upwind)	670 m^2	700 m^2	1000 m^2
(downwind)	1080 m^2	1000 m^2	1500 m^2
Mast height	45 m	45 m	45 m
Rig(s)	Single	Single	Twin (equal length)
	Fixed	Rotating wing	Fixed
	Single spreader	Spreaderless	Four spreaders
Crew	13	14	23

only problem being a blown headsail. This being her first major trip, with the expectation of increased speed potential as the crew get to know her better, one can only imagine what this radical 40 m monohull might be capable of in a trip around the world.

New Solo Round-the-world Records

Earlier this year, French solo sailor Francis Joyon skippered the seasoned trimaran *Idec*, ex *Sport Elec*, solo around the world. His time of 72d 22h 54m 22s blasted all previous solo records into history, taking more than 20d off the outright solo record previously set by Michel Desjoyeaux in 2001 in the Open 60, *PRB*, of 93d 3h 57m 32s, and more than 50d off the solo multihull record set by Olivier de Kersauson in1989 in the same boat, *Un Autre Regard*, of 125d 19h 32m. More astonishing, he finished within a day of the previous fully-crewed record set in the same boat by Olivier de Kersauson in1997 and six crew in *Sport Elec* of 71d 14h 18m 8s. Joyon covered 27 150 n miles at an average speed of 15.5 knots.

In the opposite direction, another seasoned French sailor, Jean Luc van de Heede, doggedly drove his custom-designed 25 m aluminium monohull, *Adrien*, to a new eastabout around-the-world record. He stopped the clock in 122d 14h 3m 49s, covering 25 564 n miles at an average speed of 8.69 kn. The new time was well under the previous record of 151d 19h 54m 36s held by Philippe Monnet in a reconditioned Open 60 monohull. This was van de Heede's fourth attempt at the record. His first attempt in a composite Open 60 monohull, *Algimouss*, was halted by delamination of the hull. Two subsequent attempts in his new boat were ended, the first one by cracking around the keel, and the second one by a dismasting near Tasmania.

Felix Scott

INDUSTRY NEWS

Wärtsilä Powers Australian FPSO

Wärtsilä Corporation has been awarded a contract to supply a 31.5 MW diesel power plant for a floating production, storage and offloading (FPSO) vessel for the Mutineer-Exeter field of Santos Ltd off the north-west coast of Australia.

The plant has been ordered by MODEC Inc of Tokyo, Japan, a leading designer and supplier of FPSO vessels, floating storage and offloading (FSO) vessels and tension-leg platforms for the world oil and gas industry. MODEC is converting an existing Suezmax tanker, of about 150 000 tdw, into a turret-moored FPSO vessel for Santos Ltd of Australia. It will be operated by MODEC on the Mutineer-Exeter field (WA-191-P) which is located approximately 150 km due north of Dampier.

FPSO vessels combine full production facilities — process equipment, control equipment for remote wellheads, crew accommodation and crude oil storage capacity — into one unit. The Mutineer-Exeter FPSO vessel will have a storage capacity for 930 000 barrels of crude oil and will be moored in 156 m water depth. The turret mooring will allow the vessel to be disconnected easily when a cyclone approaches so that it can temporarily leave the field. The vessel will be capable of processing 100 000 barrels of crude oil per day, and can treat 125 000 barrels per day of produced water. The first oil from the field is planned for mid 2005.

The Wärtsilä power plant comprises five diesel generating sets, each powered by a Wärtsilä 16V32LNE engine. Diesel engines were selected because the Mutineer-Exeter oil field has no gas which could be used as fuel. The engines will run on treated crude oil.

The Wärtsilä plant will supply electrical power for subsurface electric submersible pumps, subsea multiphase pumps, seawater injection pumps, process plant and general electrical services on board the FPSO vessel.

This order for the Mutineer-Exeter FPSO follows on from the considerable experience with Wärtsilä engines in the offshore oil and gas industry. Some 95 Wärtsilä 32 engines are in service or on order for oil and gas applications. They have demonstrated excellent reliability, availability and operating economy, and are operating in almost every major offshore oil and gas field around the world.

The FPSO vessel ordered by MODEC for the Mutineer-Exeter field of Santos Ltd will be equipped with five Wärtsilä 16V32LNE diesel generating sets.
(Image courtesy Wärtsilä)

Princess Cruises Specifies Enviro Engines for New Ship

An agreement was reached in March between Princess Cruises, the engine builder Wärtsilä and the shipyard Fincantieri that Newbuilding 6100 at that shipyard will be equipped with Wärtsilä Common Rail engines. The engine configuration is four 12-cylinder engines and two 8-cylinder engines, all of the Wärtsilä 46 type in diesel-electric configuration, giving the ship the total installed power of 67.2 MW.

The Hull 6100 is a modified version of earlier ships at the same shipyard, i.e. the Carribean Princess class. The passenger capacity is 3100. The first newbuilding with common rail engines, *Coral Princess*, has now been in operation for one-and-a-half-years, and the engines have passed 10 000 h of operation. Her sister ship, *Island Princess*, has more than 5,000 h of operation. *Diamond Princess*, built at Mitsubishi Nagasaki Shipyard, is now entering service,

and the sister ship later this spring. Cunard's *Queen Mary 2* is also equipped with Wärtsilä 46 Common Rail engines. In addition to the Wärtsilä 46, also the Wärtsilä 38 and the Wärtsilä 32 are available with common-rail injection.

Since the first common-rail engines were delivered, the technology has been developed for still lower smoke values on the Filter Smoke Number scale, FSN. The new engines will have a FSN of < 0.1 on normal heavy fuel, and below 0.2 on high-ash fuels where the visibility limit is around 0.3. A further advantage is lower total fuel consumption at all loads. A new method of NOx reduction is being developed, i.e. the Combustion Air Saturation method, and it will be available for later installations, if needed. The engines are in original version compliant with the Marpol Annex VI NOx curve and an EIAPP certificate is provided.

100 Sulzer Common-rail Engines Ordered

In April 2004 confirmed orders for Sulzer RT-flex common-rail marine engines reached the landmark of 100 engines since the year 2000.

Developed by Wärtsilä Corporation, Sulzer RT-flex engines are the most advanced large marine engines available for ship propulsion today. They are the first low-speed diesel engines to have electronically-controlled common-rail systems for fuel injection and valve actuation. This gives unrivalled flexibility in the way the engines operate, to deliver benefits such as smokeless operation at all operating speeds, lower fuel consumption, reduced maintenance costs and lower steady operating speeds for better manoeuvring.

Sulzer RT-flex engines are now available in six cylinder sizes. The most popular is the largest, the RT-flex96C type, of which 59 engines have been ordered with seven, eight, ten and 12 cylinders for large, fast container vessels. In addition, there have also been confirmed orders for three 7RT-flex84T-D engines for VLCCs, two 6RT-flex68T-B engines for Aframax tankers, 17 engines of the RT-flex60C type and 15 of the RT-flex58T-B type for various ship types, and four 6RT-flex50 engines for Handymax bulk carriers.

The 100 RT-flex engines which are now in service or on order have a combined power output of 4.16 million kW. An example of the application of this engine type to large, fast container vessels, is the package of the several 12RT-flex96C engines mostly recently ordered by Odense Steel Shipyard A/S in Lindø, Denmark. They will be installed in large container liners contracted by the Danish group AP Møller-Maersk for delivery in 2005 onwards. The ships will be a lengthened version of the yard's present series of S-class vessels powered by Sulzer 12RTA96C engines of which the latest delivery is the 6600 TEU *Adrian Maersk*.

The 12RT-flex96C engines will each develop a maximum continuous output of 68,640 kW at 102 rpm. They will be built under licence from Wärtsilä Corporation by HSD Engine Co. Ltd in Korea.

These engines follow on from four Sulzer eight-cylinder RT-flex96C engines ordered in 2003 for Odense Steel Shipyard's L-class container vessels. The first of these engines began running on the test bed on 24 March 2004.

An increasing number of these engines are coming into service. The first series-built RT-flex production engine in service is the Sulzer 6RT-flex58T-B in the bulk carrier *Gypsum Centennial* which began operation in September 2001 and now has more than 14 000 running hours. Five further ships with RT-flex engines have since entered service, all with very satisfactory experience.

The Sulzer 8RT-flex96C common-rail engine during its official shop test in the works of HSD Engine Co Ltd in Korea. The engine develops 45,760 kW at 102 rpm, and measures about 15.8 m long and 13.5 m high
(Photo courtesy Wärtsilä)

Wärtsilä Engines for Russian Icebreaker

Wärtsilä Corporation has received an order for four engines for installation on the first Sakhalin icebreaker to be built by the Kvaerner Masa-Yards shipyard in Finland. The vessel will be equipped with three 8-cylinder Wärtsilä 38 main engines in diesel-electric drive and an additional 6-cylinder Wärtsilä 20 engine to power a harbour/emergency generating set.

Kvaerner Masa-Yards has been commissioned to design and build the icebreaker by the Russian Far-Eastern Shipping Company PLC (FESCO). Headquartered in Vladivostok, FESCO is the largest shipping company in Eastern Russia. Its strategy is to be the leading operator of icebreakers and ice-class vessels in East Asia.

Scheduled for delivery to FESCO in 2005, the 4000 dwt vessel will have an overall length of 100 m and a shaft output of 13 MW. The Wärtsilä 38 engines will each have an output of 5800 kW at 600 rpm and the Wärtsilä 20 engine will have an output of 1080 kW at 1000 rpm. The engines are scheduled for delivery to Kvaerner Masa-Yards during autumn 2004.

FESCO will operate the icebreaker as a stand-by and supply vessel in Russian waters in the Sea of Okhotsk in the region of Sakhalin Island north of Japan. Conditions in the region are extremely demanding: air temperatures can drop to below minus 40 C°, ice banks can be as high as 20 m, and solid ice can be more than 1.5 m thick.

For this reason the design of the new icebreaker is based on the DAS (double-acting ship) concept developed by the Masa-Yards Arctic Research Centre (MARC) and now a standard in arctic operation. This means that the ship breaks thick ice by going astern. It reduces power consumption while also allowing the vessel's bow to be optimized for sailing in open waters.

Rectangular Section Propeller Tunnels

Greg Cox

Propeller tunnels in high-speed craft are now common as designers seek to reduce shaft angle, move propulsion machinery further aft or reduce draught. Whereas they were once thought of as an unnecessary complication to construction or as a bit of a hydrodynamic "mystery bag", pressure from competing waterjet installations in high-speed craft has forced their application.

The classic tunnel design with a semi-circular section and sweeping longitudinal shape is not particularly easy to loft and build (CAD people can ignore the first statement). For GRP vessels, adding tunnel blockouts to a mould means making a plug and then a mould for the tunnel — such a compound surface cannot be added in as a simple, one-off mould blockout made from melamine or MDF. For aluminium vessels, the compound shape can only be made as a lobster-back arrangement — the number of segments determining the fairness of the tunnel. With most design rules requiring heavier plating in way of the propellers, a metal tunnel would need to be fabricated from relatively heavy plate with complex stiffening and framing above.

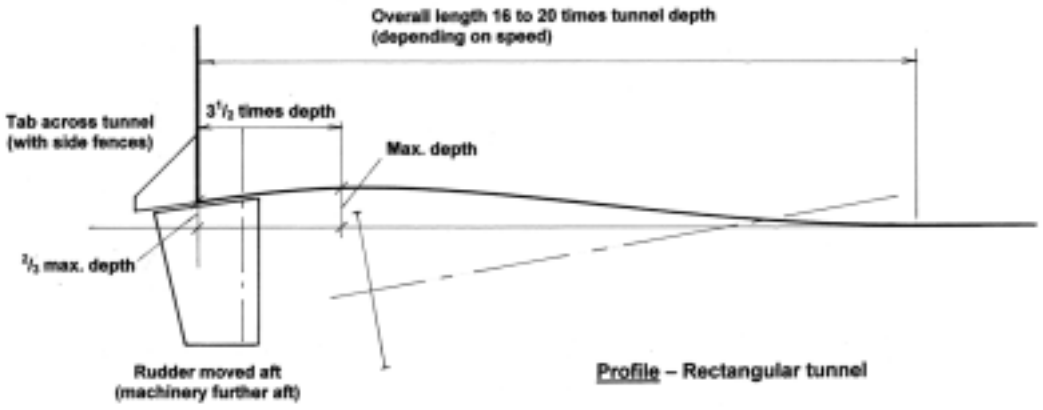
For someone such as myself who still chooses to draw by hand, loft traditionally and cut manually (i.e., a leper in this industry), necessity is the mother of invention — the necessity not to spend hours kneeling on a hard loft floor trying to pattern up tricky shapes like expanded compound surfaces. About ten years ago I was asked to convert one of my small GRP stern-drive designs to a single v-drive shaft drive, requiring a tunnel to keep the engine room short. No one had any desire to make a tunnel blockout with semi-circular shape, so we fitted one that was rectangular in section, not unlike the intake of some water jets. The mould blockout was easily made from flat sheets of MDF. I don't claim to be the first to use this tunnel shape in a high-speed vessel, but I can only find examples of semi-circular tunnels in the trade literature.

This tunnel design has been used on several vessels since, including five 22.8 m aluminium catamaran patrol vessels designed and built for the Royal Malaysian Police in 2003. In all cases the tunnels were in single-screw applications (single screw per hull for the catamarans), but there is no reason why they should not work in a twin-screw application. Almost without exception, the trials speed of all of the vessels fitted with the rectangular section tunnel design has been higher than predicted. The catamaran design was model tested (with tunnels) and, even without any model testing allowances to the raw tank data, the performance was still about 1.5 kn higher than the most optimistic prediction. Other monohull designs fitted with the tunnels, in some cases quite severe in depth relative to waterline length, are generally running about a knot or so better than expected. In all cases the maximum speed is around the mid-20 kn range — we have yet to build a vessel with a higher speed.

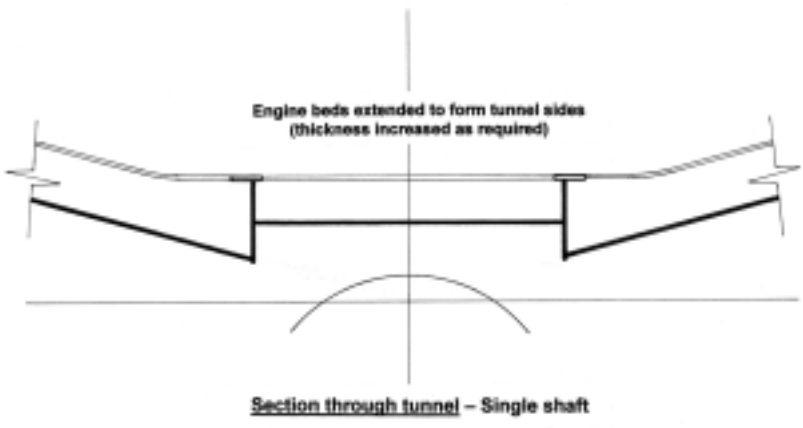
Structurally, the rectangular tunnel has many benefits. We usually make the sides of the tunnel as an extension of the engine beds, remembering that the thickness of this extended bed in an aluminium vessel will need to be increased in way of the tunnel, as all of the bottom plating over the propeller must be heavier. A common mistake in shaft drive-vessels is not having a sufficiently stiff structure over the propellers, a situation that arises when the designer takes advantage of the feature of most design rules which allows a reduction in bottom pressures in the aft part of the vessel. The rectangular tunnel that extends the engine beds to the transom ensures adequate stiffness, though there is the loss of the natural stiffness that the curved plating of a semi-circular tunnel affords. In a twin-screw metal boat, using the extended engine beds as the tunnel sides will result in a racked rectangular section, with vertical tunnel sides but with the tunnel top following the deadrise. This is not expected to affect performance in any way. A twin-screw GRP boat does not need to use the racked shape.

The tunnel top can be made as a single piece of plate which can usually be pulled into its longitudinal curve on the job. With a semi-circular tunnel of lobster-back design there is always the risk of a plate butt lying close above the propeller, and the fit-up and welding of the lobster-back segments may not be perfect. Stiffening of the rectangular arrangement is also quite simple.

Another advantage in a single screw application is that the rudder blade can be fitted close to the tunnel top. When turned, the rudder-blade root will move slightly away from the tunnel top, unlike in a semi-circular section tunnel where



Tunnel profile
(Drawing Greg Cox)



Tunnel section
(Drawing Greg Cox)

the blade root must be severely cut away or the blade set away from the hull with a fairing piece. For a twin-screw application, we have considered fitting rudders square off the tunnel top to maintain this close fit, but with accompanying complication in the design of the steering gear and tie bars.

We also extend the tunnel past the transom to form a fixed trim tab, either just in way of the tunnel or extending the full width of the transom. The tab appears to be particularly effective when used as a tunnel/tab combination, and it allows the rudder to be positioned even further aft, moving the whole machinery installation aft in the process. This is desirable, as the original intent of this feature was to develop a shaft-drive equivalent of a stern drive (and hence a waterjet drive), benefiting from the stern drive/waterjet advantages of positioning the engine room and machinery weight as far aft as possible.

Hydrodynamically, the transition between hull bottom and tunnel top is shorter and less abrupt in the rectangular section tunnel. I believe that vortices formed along the edges of a semi-circular tunnel at high speeds would detract from its benefits. Also, the water flow at the top of a semi-circular tunnel may not benefit the hydrodynamics of a planing hull, as some additional transverse flow component may be generated.

The greatest mistake with tunnels is not turning down the aft end of the tunnel to some degree. The turn-down has two effects. Firstly, it creates a head-trim moment that offsets the stern trim moment generated by the forward part of the tunnel. Secondly, it acts to recover some of the static pressure head lost in the forward part of the tunnel, possibly improving the cavitation characteristics of the propeller and improving propeller efficiency by changing the wake fraction slightly.

As a design guide for speeds below 30 kn, the tunnel should have the following dimensions (note that depths are measured relative to the original hull centreline for a single screw application)

- Tunnel depth: maximum 2% of LWL (though could probably go to 2.5% in a small vessel)
- Tunnel length-to-depth ratio: between 16 to 20 (longer tunnel for higher speed)
- Point of maximum depth: approximately 3.5 tunnel depths forward of the transom, but this will depend on the propeller dimensions and rudder clearances
- Tunnel depth at transom: two-thirds of the maximum tunnel depth
- Propeller tip clearances: minimum 15% of diameter.

Presently we have eight designs operating successfully with rectangular section tunnels and, this year, we will design and build our largest vessels to be fitted with them. Two new GRP vessels are being built this year, both fitted with semi-circular tunnels in a twin-screw installation. The builder is keen to see the difference between the two options, and one vessel will have a maximum speed of about 34 knots. The first vessel launched (9m long monohull, 23 knots) has been trialled. It is difficult to assess the effect of these shallow semi-circular tunnels on a small vessel, as the performance of small craft is often difficult to predict with certainty. However, it can be said that the semi-circular tunnels did us no favours in terms of performance and we will probably look at re-jigging the machinery on future variants to remove the tunnels altogether.

Rectangular tunnel installation on a 25 kn, 22.8 m aluminium catamaran. Tunnel depth was moderate at only 1% LWL, with a tunnel width of 800 mm — sufficient to achieve the contract draught limit. Note the full-width trim tabs and the tab fences incorporated into the brackets. Similar fences could be incorporated along the tunnel edges themselves for those willing to make the effort. Contrary to a recent theoretical analysis showing that fences (end plates) have an inconsequential effect on tab performance, we now fit them as standard on trim tabs having experienced their practical benefits.
(Photo Greg Cox)

The Evolution of Australian Tug Design

Noel Riley
Commercial Marine Design

1. Introduction

I believe in keeping a low profile and, now that I am in my declining years, I further believe that the way should be made for the younger generation to use these meetings to advance the art and science of the profession. However, there was a recent event that prompted me to put the following notes together on the development of tug design in Australia to keep the record straight for those that follow.

I was informed recently, by a colleague, of a conversation that he had had with the representative of an international marine-equipment manufacturer, resident here, in which the latter stated that "no-one knew much about tug design in Australia". This indicated to me that the historical knowledge of the contemporary profession may be lacking in some areas. Therefore, to prevent those who come after me from having to re-invent the wheel (or, in this case, the tug) I thought that it may be a worthwhile exercise to say something on the development of tug design in Australia which appears to go back well into the early twentieth century.

2. Early Tug Construction

I happened to be reading Gwen Dundon's (1997) book *The Shipbuilders of Brisbane Water NSW,* and noted that in 1904 a tug named *Sir James Wallace* was launched from a shipyard in that district owned by George Frost. He was my great-grandfather, and his foreman shipwright was Thomas Riley, my grandfather. The vessel was launched by Ellen Riley, his daughter and my aunt. I understand that the vessel was for Wallace Tugs and was subsequently re-named *Robbie Burns*, shown in Fig. 1.

Fig. 1 *Robbie Burns* (ex *Sir James Wallace*)
(Reprinted from Dundon 1997, courtesy Graeme Andrews)

You will note that she was fitted with cabins for fishing enthusiasts. In the current tight economic times, with increasing competition in the local towage industry, there may be some merit in converting the existing tugs for the dual roles of ship handling and fishing charters, thereby obviating the need for tug crews to go on permanent part-time employment.

3. Personal Memory

My memory of the tugs in Sydney only goes back about sixty years, and I guess there will be those here whose memory goes back further than that.

Our family moved down to Balmain in 1942 when my father was instrumental in opening up the boatbuilding side of Storey & Keers at a shipyard situated at the foot of Campbell St in Balmain. Some of the early vessels built in this shipyard were 45 ft (13.7 m) tugs for the US Army, as shown in Fig. 2. The drawings I have of these vessels indicate that they were designed by Arthur Swinfield.

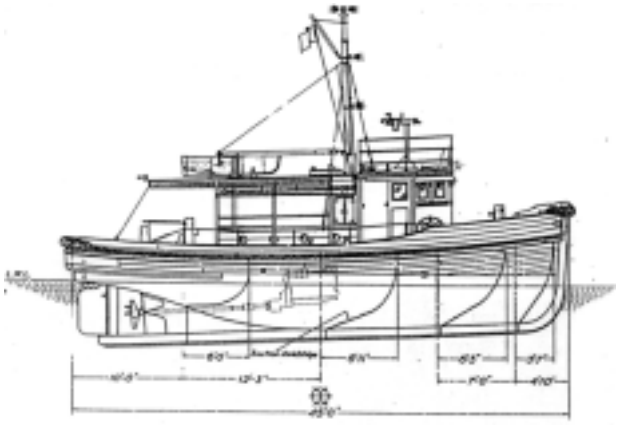


Fig. 2 45 ft (13.7 m) tug profile)
(Reprinted from Alsop 1996 with permission)

In those days there were two major tug companies in Sydney, Fenwicks and Waratah. The tugs operated by Fenwicks included *Heros*, *Lindfield*, *Hero*, *Heroine*, *Newburgh*, *Leveret* and, later on, *Himma* joined the fleet. Some of those operated by Waratah were *St Giles*, *St Arristel*, *Wonga*, *Warang* and *Game Cock*. There was another tug company, jointly owned by Fenwicks and Waratah, which had tugs named *Theresa Ward* and *Bustler*. All of these tugs were steam powered.

Some of the tugs mentioned above were retrofitted with Kort nozzles in the 1950s to increase their static bollard pull. While the fitting of the nozzles certainly increased the bollard pull, one adverse effect on those vessels fitted was that their directional stability, particularly going astern, was enhanced thus detracting from their manoeuvrability.

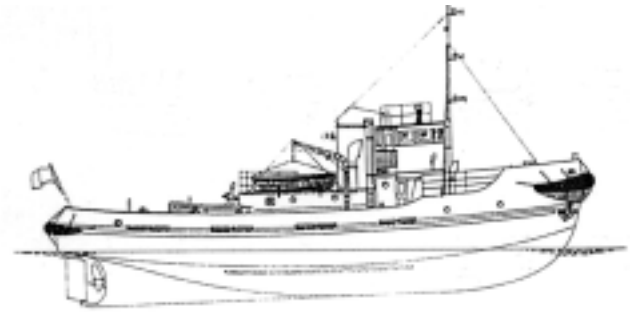


Fig 3. 75 ft (22.9 m) steel tug profile
(Reprinted from Alsop 1996 with permission)

A number of diesel-powered tugs were built for the armed forces during World War II. These were timber 45 ft (13.7 m) tugs, mentioned above, and 75 ft (22.9 m) steel tugs, as shown in Fig. 3. Mort's Dock, Poole & Steele, and Walkers built some of the larger 93 ft (28.3 m) diesel-powered tugs, shown in Fig. 4, which were to be used for the invasion of Japan, but WWII finished and they only saw service with the Maritime Services Board in Sydney and the Royal Australian Navy. These included *Boray*, *Boambilly* and *Burrowaree*. Others such as *Emu*, *Bronzewing* and *Mollymawk* were transferred to the Navy. These tugs had open-water propellers and direct-reversing engines. However, their arrangements were essentially similar to those

of steam-powered tugs, except that the boilers and steam engines were replaced by diesel engines.

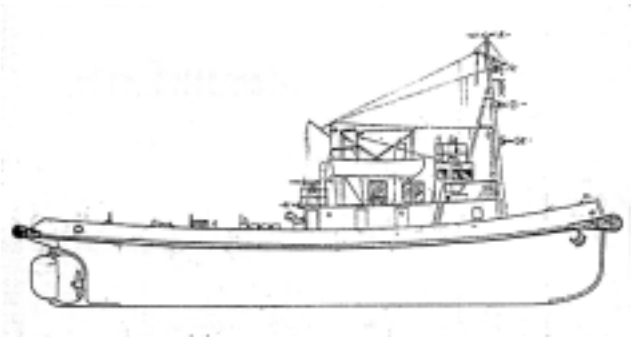


Fig. 4 93 ft (28.3 m) steel tug profile
(Reprinted from Alsop 1996 with permission)

The design of tugs did not change much between the late 1800s and the 1950s. They all had a similar arrangement to that shown in Fig 5. In general, they had a relatively deep draft, to accommodate a large slow-turning open propeller, were low-wooded and had a reasonably steep sheer forward. One exception was *St Giles*, as this tug was fitted with a forecastle.

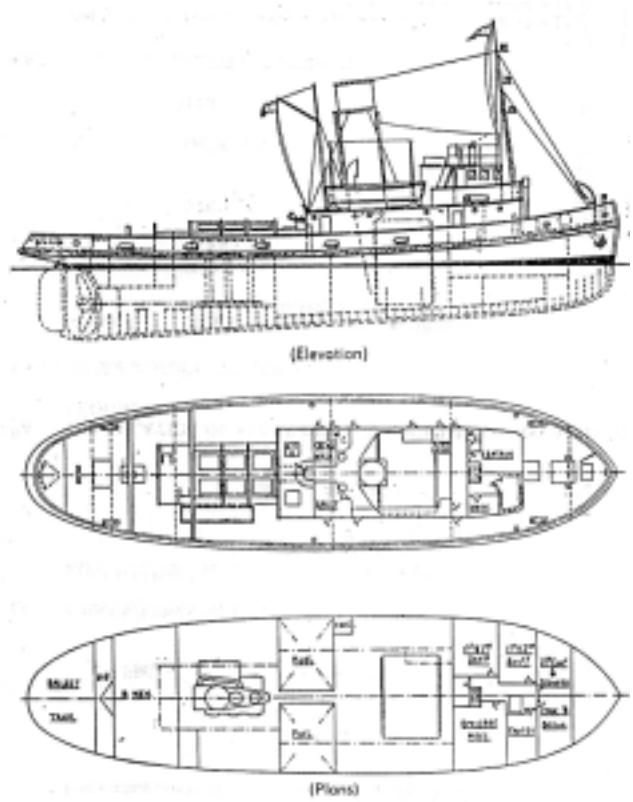


Fig. 5 General arrangement of steam estuary and harbour tug
(Reprinted from Caldwell 1947)

The last commercial steam tug to enter service in Sydney Harbour was *Woona*. She was built in the UK and went into service here in about 1953.

A number of steam tugs were built in Australia prior to and after WWII. These included *Wonga*, *Warang*, *Batman* and *Howard Smith*. Two rescue tugs were commenced at Cockatoo Island towards the end of WWII but were broken up upon the cessation of hostilities.

The first commercial diesel-powered tug to enter service in Sydney Harbour was *Sydney Cove*. She was ordered by Fenwicks, was built in the UK and was one of the early Burness Corlett tugs with their patented Hydroconic hullform. She entered service in Sydney Harbour about 1956 and is shown in Fig. 6 A second diesel tug, *Sirius Cove*, was also procured from the UK by Fenwicks and is shown in Fig. 7. She arrived in Sydney Harbour about 1958, was twin screw, and also had a Hydroconic hull form. In addition, she had a patented tripod mast that had the main engine exhausts in the rear legs of the tripod.

Fig. 6 *Sydney Cove*
(Photo courtesy Graeme Andrews)

Fig. 7 *Sirius Cove*
(Photo courtesy Graeme Andrews)

Around 1956–57, Adelaide Steamships re-opened a shipyard in Port Adelaide. This shipyard built a series of diesel tugs between the late 1950s and the late 1960s to re-equip the Australian tug fleet and change it from steam power to diesel power. These tugs had single open-water propellers, were designed by Burness Corlett and Partners and had their patented Hydroconic hullform.

The patented features of this hullform included an upper limit on the angle of the run-up and the fore end, below the chines, was a developable surface. Although these features were prior art in Australia, I am of the opinion that the application of this particular patent was sufficient to stifle local tug design for a number of years.

4. Pioneers of Modern Tug Design in Australia

The pioneers of modern tug design in Australia were Jim Eken, John Doherty, John Boulton, Tom Barnes, and Neil Fleck.

4.1 Eken and Doherty

While there had been itinerant consulting naval architects around for many years, including names like Walter Reeks,

Alex Barber, Arthur Swindfield and Cecil Boden, it remained for Jim Eken and John Doherty to form the first commercial naval architectural consulting organisation here in about 1954. The company's first commission in the tug design field occurred in 1960, to convert two steam tugs to diesel propulsion. These were the tugs *Farm Cove* and *Manly Cove*, which were owned by Fenwicks. They had originally been operated in the Middle East by British Petroleum and were transferred to its refinery in Cockburn Sound in WA after the nationalisation of the oil industry in the Middle East. They were re-named *Cockburn* and *Parmelia*. They were about 128 ft (39.0 m) long and originally had a bollard pull of approximately 12 tons (12.2 t).

The conversion of these two vessels involved taking out the steam plant and steam-driven auxiliaries, replacing the main machinery with a Mirrlees diesel main engine and a MWD two-speed reduction box, diesel-driven auxiliaries, hydraulic steering gear and an hydraulic windlass. The superstructure was re-designed and the engine-room casing was disposed of to give an unobstructed working deck aft. The bollard pull of these vessels was increased to 21 tons (21.3 t) which, in those days, gave tug of significant bollard pull.

It is interesting to reflect on the attitudes of the operators of that time. Ron Fenwick was the managing director of Fenwicks, and Rupert Weldon was his superintendent engineer. Mr Fenwick had served his apprenticeship in marine engineering and was engineer on the family's tugs prior to assuming control of the company. Rupert Weldon had come up through the ranks in a similar manner also.

When the main machinery was chosen for *Farm Cove* and *Manly Cove*, there were two alternative proposals. One was the proposal from Mirrlees which provided engines of 345 RPM at MCR, and the other was the proposal from Lister Blackstone which provided engines of 750 RPM at MCR. The most cost-effective proposal was that put forward by Lister Blackstone. However, the decision was made to install Mirrlees machinery because the decision-makers had spent their lives around steam engines of about 180 RPM. To install main engines of 345 RPM was a quantum leap, but to install engines of 750 RPM was beyond the pale.

Eken and Doherty also converted the steam tug *Carlock* which operated in Brisbane. The conversion was on a similar scale to that of *Farm Cove* and *Manly Cove* but, in addition, she was provided with a three-speed reduction box.

In 1962 Eken and Doherty designed a diesel tug for the port of Burnie. She was about 85 ft (25.9 m) long and had a bollard pull of approximately 15.5 tons (15.7 t). All of the auxiliary machinery was hydraulically driven to minimise the requirements of electrical maintenance.

The company subsequently designed numerous tugs and offshore supply vessels for local and overseas operation.

4.2 John Boulton

In about 1961, John Boulton became manager of Stannards' shipyard in Berry's Bay. Stannards at that time ran lines launches and small tugs. At the instigation of Alan Stannard, John designed and built a number of tugs to re-equip the Stannard fleet. The first was a tug of about 56 ft (17.1 m) length which was powered by a 12V-71 series GM diesel whose output was of the order of 210 kW (280 HP). These tugs had a bollard pull of about 4 tons (4.1 t).

Another type of tug was also built. This was about 70 ft (21.3 m) in length, and was powered by two 12V-71 series GM diesels each driving a propeller in a nozzle, giving a bollard pull of about 10 tons (10.2 t).

About 1968, after he had left Stannards and commenced his own consulting practice, John designed a twin-screw nozzle tug of about 80 ft (24.4 m) length which was powered by two Lister Blackstone engines, each of about 450 kW (600 HP), giving a bollard pull of about 20 tons (20.3 t).

4.3 Barnes and Fleck

Tom Barnes and Neil Fleck designed their first tug, *Tom Tough*, in 1969. She was 26 m long, twin screw and had a bollard pull of 21 t. This design was followed by another class of tug that was 29 m long and had a bollard pull of about 43 t. After that they designed a series of twin-screw tugs that were 32 m long, with a bollard pull of 45 t provided by steerable right-angle drive propulsion units. Subsequently, another series of tugs to their design were built, 34 m long, and with a bollard pull of 50 t provided by steerable right-angle drive propulsion units. This company prepared numerous tug designs, from which approximately sixty vessels were built.

5. Introduction of Steerable Right-angle Drive Tugs to Australia

In the late 1960s the management of Fenwicks sent a team overseas to assess the then latest developments in tug design and operation. As a result of the information collected on the tour, Eken and Doherty were commissioned to prepare the design of a twin-screw steerable right-angle drive tug which incorporated Daihatsu main engines and IHI Duckpeller propulsion units. Two tugs were built at Carrington Slipways in Newcastle and went into service in 1971. They were approximately 26 m long and were named *Shell Cove* and *Careening Cove*. A little later the Port Adelaide shipyard built a Burness Corlett-designed tug for Adsteam that had similar main machinery. The vessel was named *Warilla* and was effectively a standard Hydroconic hull. I designed a steerable right-angle drive tug for Hamersley Iron, named *Pilbara Neptune***,** shown in Fig. 8, which was built by Ballina Slipway & Engineering in Ballina, and went into service in 1972. These four tugs all had the same main propulsion systems and the bollard pull of each was about 27 t. As a matter of interest, the contract price for *Pilbara Neptune* was $750,000.

I understand that the general opinion of the movers and shakers in the tug industry at the time was that this form of propulsion was "a good idea, but too expensive".

6. The Next Re-Equipping Program

The steam tug fleet was phased out in the late 1960s by the single-screw tugs which were built in Port Adelaide.

There was one development which had a significant effect on future tug design, and this was the lapsing of Kort's patent on the design of nozzles and associated propellers. This patent lapsed in the 1950s, and the Netherlands Ship Model Basin (now MARIN) at Wageningen in The Netherlands

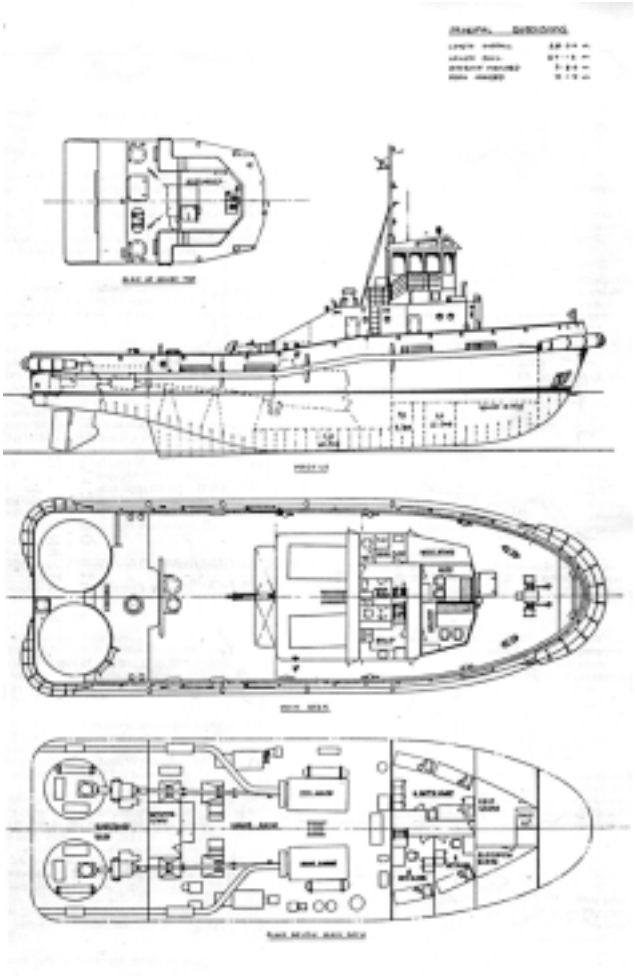


Fig. 8 General arrangement of *Pilbara Neptune*
(Drawing courtesy Commercial Marine Design)

carried out extensive research on the application of nozzle propulsion. The first generally-available paper on the subject was that published by van Manen (1963). This was followed in 1973 by a symposium held by RINA in London on the subject. Oosterveld's doctoral thesis, subsequently published by the NSMB (1973), further made available a substantial body of design data on nozzle propulsion.

In the early 1970s another tug replacement program in Australia was instituted. This saw the introduction of twin-screw nozzle tugs having a bollard pull of the order of 45 t, such as *Pilbara Jupiter*, shown in Fig. 9. Various designs were developed but the main propulsion machinery was, in the main, provided by Lister Blackstone diesels driving through reduction boxes to fixed propellers in independently-steerable nozzles. The main engines were of 895 kW (1200 HP) brake power at 1000 RPM and the reduction ratio was of the order of 5:1. The nozzles were MARIN Type 19A. This nozzle profile gave good ahead pull, but serious vibration problems were experienced when full power astern was applied because the nozzle profile caused flow separation when going astern under these conditions. The astern vibration problem was subsequently solved by the introduction the Type 37 nozzle profile. This profile had a significantly thicker trailing edge than the 19A profile, and produced a reduction in the ahead pull but significantly increased the astern pull.

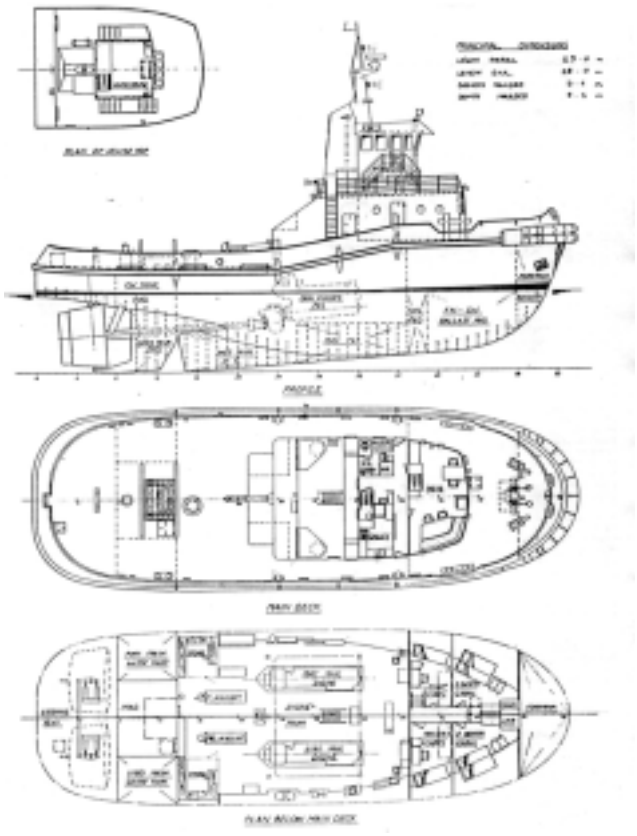


Fig. 9 General arrangement of *Pilbara Jupiter*
(Drawing courtesy Commercial Marine Design)

7. Re-Equipment of the Tug Fleet with Steerable Right-angle Drive Tugs

Subsequent to the introduction of twin-screw nozzle tugs, there was a shift in opinion of the industry movers and shakers on the type of tug that was to service the Australian towage industry. In the early 1980s twin-screw steerable right-angle drive tugs were introduced. These were of the order of 32–34 m in length with a bollard pull of about 55 t, such as *Pilbara Star* and *Pilbara Saturn*, shown in Fig. 10.

There was a further development in the early nineties when five steerable right-angle drive tugs were built. These were smaller, about 28 m in length, with high-speed (1800 RPM) main engines and a bollard pull of about 45 t, such as *Pilbara Mars* and *Pilbara Comet*, shown in Fig. 11. The move to high-speed engines did not meet with universal approval of the operators. When asked their opinion of high-speed main machinery, one comment was that they did not have the "grunt" of a medium-speed engined tug. Since the propellers don't know whether they are being driven by rubber bands, teams of coolies on treadmills, or medium-speed or high-speed engines, I think this view was somewhat subjective.

I believe that the move to high-speed engines was a positive step. Although they may not have the longevity of medium-speed engines, the fact that tug main machinery is only used for 1000 to 1500 hours per year means that the high-speed engine still lasts for the economic life of the tug. The advantages flowing from this type of installation include small components and ease of availability of spares if common brands of industrial engines are used. Also the commensurate bollard pull can be installed in a smaller hull.

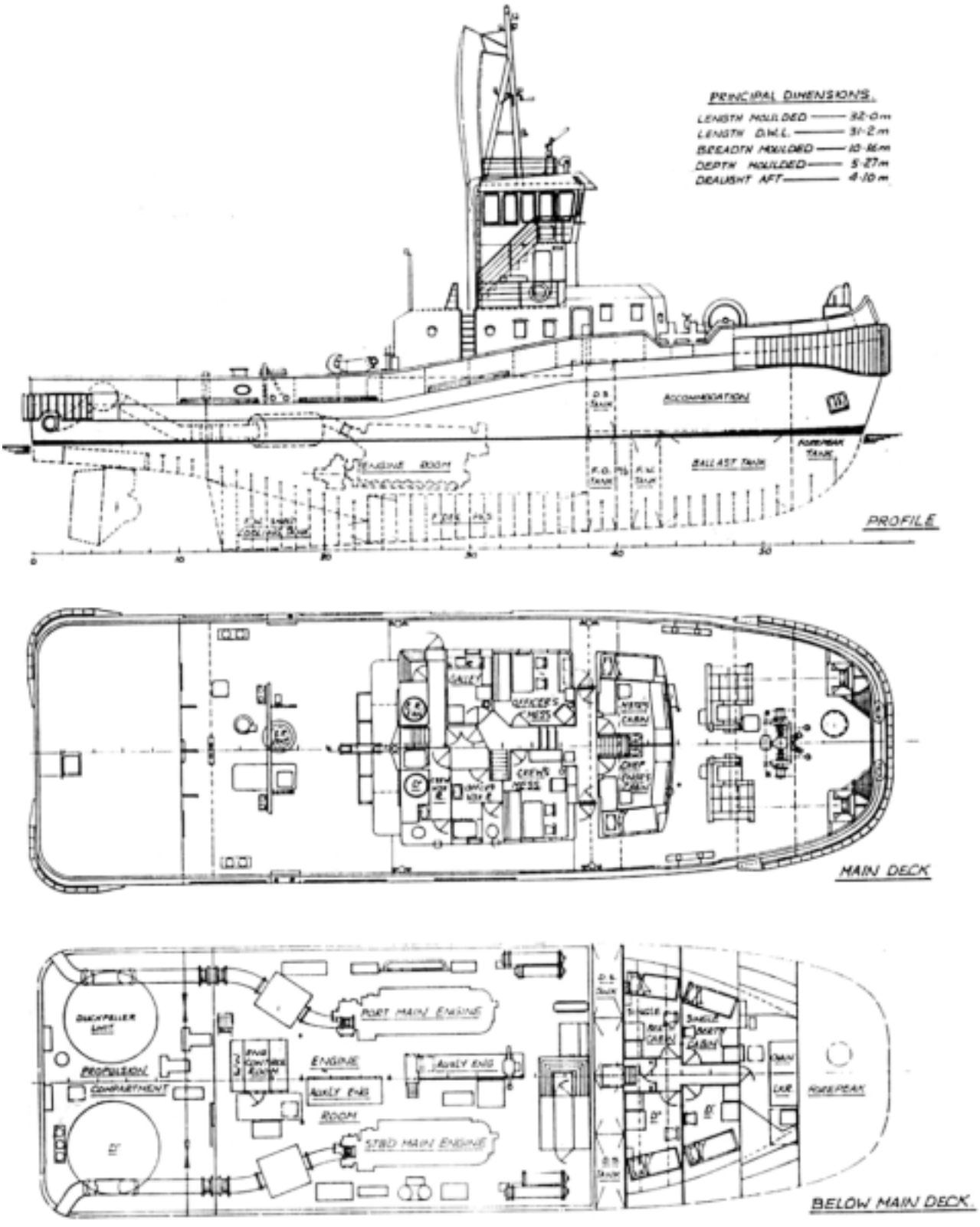


Fig. 10 General arrangement of *Pilbara Star* and *Pilbara Saturn*
(Drawing courtesy Commercial Marine Design)

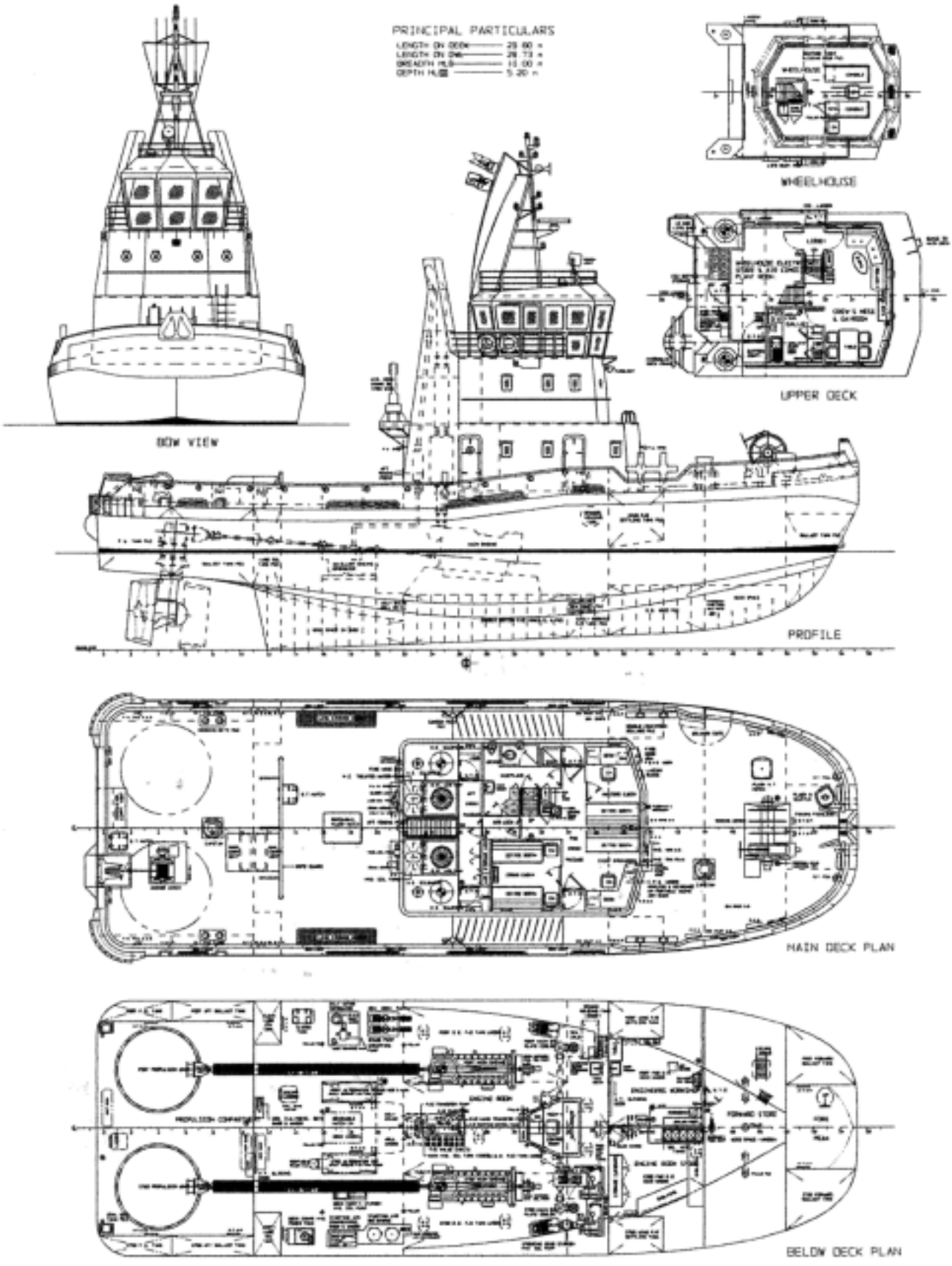


Fig. 11 General arrangement of *Pilbara Mars* and *Pilbara Comet*
(Drawing courtesy Commercial Marine Design)

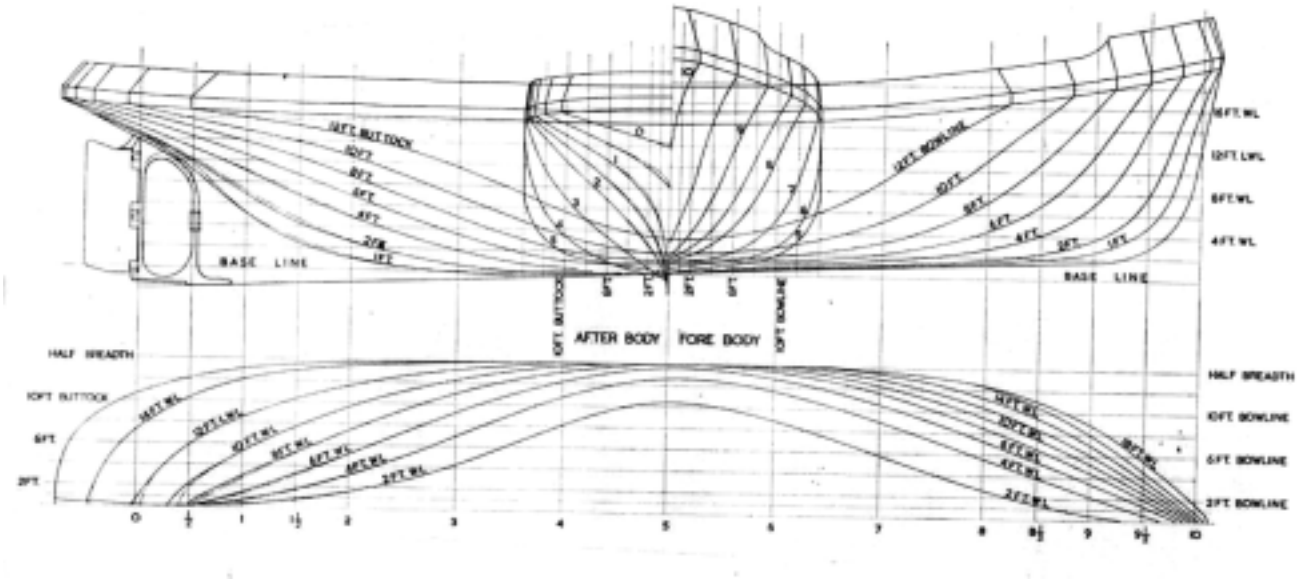


Fig. 12 Lines of 1950s steam tug
(Reprinted from Parker and Dawson 1962)

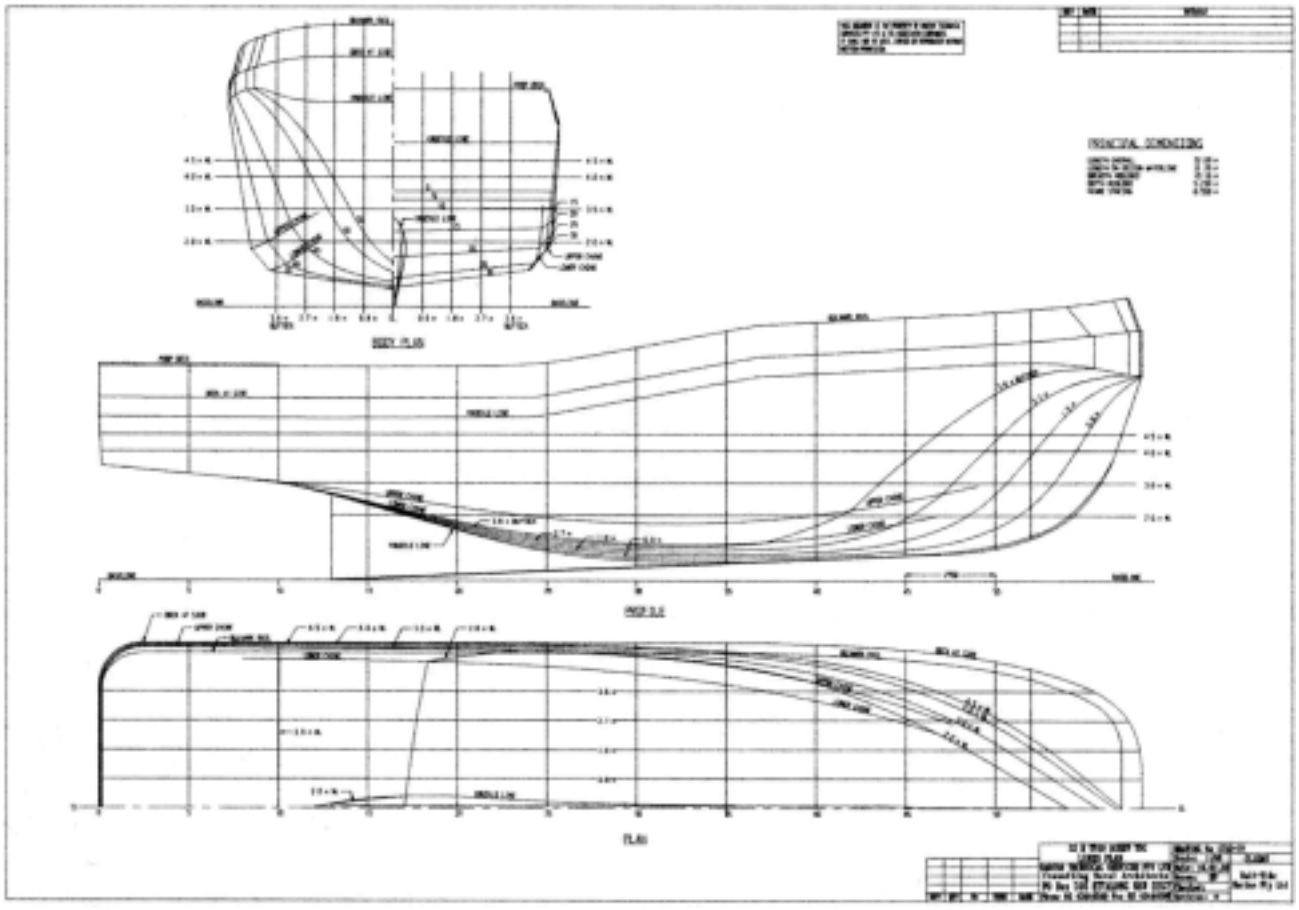


Fig. 13 Lines of 2003 twin-screw RAD tug
(Drawing courtesy Commercial Marine Design)

The late 1990s saw another tug-building program introduced. This was for seven medium-speed diesel tugs of about 32 m in length with a bollard pull of 55 t. This building program had an unfortunate history. The shipyard in Western Australia which was contracted to build the vessels went bankrupt early in the project, and the remaining unfinished vessels were completed either in Indonesia or New Zealand. Given that competent shipyard capacity existed in Australia, capable of completing the program, I am a little surprised that the work went offshore.

8. Changes In Hull Design

There have been significant changes in the hullforms of tugs over the last fifty years.

Table 1

Form of Propulsion	Pull/100 HP tons	Pull/100 kW tonnes
Vertical axis	1.0	1.32
Steerable right-angle drive	1.25	1.65
Open-water propeller	1.5	2.97
Nozzle and fixed-pitch propeller	2.0	2.63

Fig. 12 shows the lines of a steam tug of the late 1950s, while Fig. 13 shows the lines of a contemporary diesel-powered steerable right-angle drive tug. The vessels are of approximately similar length but the bollard pulls are of the order of 20 t and 55 t respectively.

9. Are Steerable Right-angle Drive Tugs Really Necessary?

It has been asked of me on more than one occasion "You might be a naval architect but what do you know about tug design?" My reply has always been "Not much". On this basis then, as a layman, I may be permitted to make one or two observations on the existing forms of tug propulsion and their applicability to the Australian scene.

Speaking in broad terms, it can be said that the effectiveness of the various forms of propulsion available in contemporary tugs covers a fairly wide range, as shown in Table 1.

In terms of efficiency and maximising bollard pull, for a given engine installation, the nozzle and fixed-pitch propeller combination is about 60% more efficient than the steerable right-angle drive system. However, it is of some interest to note that tugs built in Australia for commercial operation since the early 1980s have all been fitted with steerable right-angle drive propulsion systems.

I think that it is an incontrovertible fact that the latter form of propulsion provides a more manoeuvrable tug, but the cost of a tug with this form of propulsion, both in capital cost and running costs, is more than that of a tug having the former propulsion system.

This then raises the question: Are steerable right-angle drive tugs really necessary for all towing operations in the ports around the Australian coast?

I do not believe this to be the case. I do agree that in ports where there are confined spaces, and hence difficult berthing manoeuvres are required, then steerable right-angle drive tugs or vertical-axis (Voith Schneider) propelled tugs are the optimum. However, in open roadsteads, where manoeuvrability is not such an issue, then I am of the opinion that twin-screw nozzle tugs provide a more cost-effective towage solution.

The operation at Hay Point, on the central Queensland coast, is a case worth mentioning. There are two separately-operated loading facilities for the coalfields of that area. Both have jetties extending out into the open sea, behind the Great Barrier Reef. The approach to, and departure from, each terminal is relatively simple, with plenty of sea room available in the immediate area. One terminal uses two steerable right-angle drive tugs, each of about 50 t bollard pull and the other uses two twin-screw nozzle tugs of about 70 t bollard pull. Both terminals have operated for in excess of twenty years. The questions that I raise in this instance is: Are steerable right angle drive tugs really necessary and, in serious situations where brute strength is required, is not the twin-screw nozzle propulsion system preferable? I leave the answers to these questions to those more expert in tug design than myself.

10. The Future

Since slowing down a little, I have recycled my crystal ball and, if any one is interested, a wizard's cap and cape can be obtained cheaply from the St Vincent de Paul shop in Woy Woy. Without these implements it is difficult to predict the future in tug design. My guess is that we will see the introduction of compact tugs having a crew of two and a single towing winch. These are the answer to an accountant-type CEO's dream. They are relatively-low first cost, and have a low crewing cost to boot. However, if I were a port-operations CEO, or an underwriter who was responsible for insuring an operation using two-man tugs, then I would be having nightmares. The risk of an accident on board that would incapacitate one of the two crew members is very real and, if such an incident occurred in a complicated towing operation, then the consequences could be quite devastating.

I will illustrate this point with one or two random examples.

As a first case, consider a loaded tanker going into Gore Bay in Sydney Harbour. Just as it rounds Ball's Head, a southerly buster hits. The aftmost tug's towline breaks and, in the process of breaking out a second towline, the skipper, who is operating the winch, heaves in at the wrong time and crushes the deckhand/engineer's hand between the fairlead and the line. The spare line does not get put aboard the tanker and her stern ends up on Berry's Island on a falling tide. The tanker breaks its back and there is an oil spill in Sydney Harbour. The cost of the clean-up and disruption to harbour traffic would be quite substantial, and the stress that would be added to the port operations CEO, appearing on the Seven-Thirty Report that evening, would be considerable.

Alternatively, consider a port operation whose cash flow is dependent upon the port being in continuous use, e.g. the iron-ore loading facility in the Port of Dampier in Western Australia. The worst-case scenario that was considered, in the days of my involvement there, was a departing bulk carrier losing steerage in the channel, swinging across the channel, grounding, and breaking its back on a falling tide. This situation would deny access to the loading facility and curtail the load-out of the product, thus stopping the cash flow.

In years gone by, the remedy to this occurrence entailed bringing in a dredge and dredging a new channel around the stranded bulk carrier. However, in today's climate, it would be necessary to carry out an environmental impact study on

the dredging operation and to cope with the various special-interest groups associated with environmental matters before any action could be taken. Also, I guess that the traditional land-owners of the sea bottom, in way of the new channel, would find some sacred sites there to further complicate matters and delay getting the operation on line again.

For tug companies that have only one bottom line (i.e. the balance sheet at the end of each quarter, half year or year), then I think we will see that two-man tug operations will be the flavour of the month. For tug companies that have three bottom lines (i.e. financial, social and environmental), then I believe that three-man tug operations will be the norm.

I am of the opinion that compact tugs will be seen in increasing numbers in sheltered-water operations, with larger tugs still being used in open roadsteads.

As mentioned above, I do not believe that steerable right-angle drive propulsion is the most cost-effective solution for all towing operations. With the advent of healthy competition in the Australian towing industry, I expect that conventional twin-screw propulsion tugs with articulated-flap rudders or other forms of enhanced manoeuvrability, will be seen in those operations that require brute force rather than intricate towing manoeuvres.

11. Conclusion

The foregoing has only scratched the surface of the development of tug design in Australia. However, I hope that, contrary to the opinions held in some sectors of the industry, it has amply illustrated that a large body of tug design expertise *does* exist in Australia and that the accumulated experience is in tune with the needs of tug operations here.

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This paper was presented at a combined meeting of RINA (NSW Section) and IMarEST (Sydney Branch) in the Harricks Auditorium at Engineers Australia, Milson's Point, on 24 September 2003.

MEMBERSHIP NOTES

Australian Division Council Meeting

The Australian Division Council met on 23 March, with teleconference links to all members and the President, Rob Gehling, in the chair. Matters, other than routine, which were discussed included:

- Website Forum: The proposal for a website forum, previously considered, was again discussed. The Chief Executive, Mr Trevor Blakeley, had informed the President that the proposal had been looked at in London and had been received favourably. Some problems associated with the proposal had been identified, but the proposal would be investigated further.
- Professional Competency: The Competency Panel of the Division, appointed by the Joint Board of RINA and EA, reported that it had actively examined the question of professional competency leading to the inclusion of naval architects in the National Professional Engineers Register. A final draft of the Division's proposal covering eligibility criteria, procedures and guidelines for registration in the area of Naval Architecture was in preparation. It was hoped that the document, after endorsement by Council, would be presented to the National Engineering Registration Board for approval.
- Removal of Container Berths from Sydney: Little further information had become available on the proposal to remove container berths from the Port of Sydney. However, Council will continue to monitor the proposal.

The next AD Council meeting is scheduled for Wednesday 9 June.

Keith Adams

Australian Division Annual General Meeting

The Australian Division held its AGM on the evening of 27 March in the Harricks Auditorium at Engineers Australia, Milsons Point, attended by eighteen with the President, Rob Gehling, in the chair.

After opening the meeting and welcoming the members, the President, Rob Gehling, spoke briefly to his inaugural report which had been circulated to all members of the Division as an enclosure to the February issue of *The ANA*. He noted that significant progress had been made through the Heads of Agreement with Engineers Australia, administered by the Joint Board. Noel Riley has now retired from there, and Rob paid tribute to Noel for his significant contribution over a number of years. He has been appointed by Council to represent RINA with Bryan Chapman on the Joint Board. A group headed by Jim Black has been established in association with the Joint Board to develop a set of competencies to enable practitioners to enter the National Professional Engineers Register of EA with naval architecture as their area of practice. Interestingly, despite the widening international membership of the RINA (London) Council, with one exception, the only representation at these Council meetings has been by Australia! Bryan Chapman and Noel Riley, as elected members, join him in ensuring that Australian members'

interests are well represented. Rob paid tribute to John Jeremy and the organising committee for Pacific 2004, the active and enthusiastic committee members of the various sections for their efforts, John Jeremy and Phil Helmore for the production of *The ANA* and the invaluable support given by Wärtsilä Australia, members for their continued support, and to the Secretary, Keith Adams, and the Treasurer, Allan Soars, for their parts in the smooth running of the Division. The Financial Statement and Auditor's Report was then presented by the Treasurer, Allan Soars, who noted that the Division's finances were healthy. In response to a question from the floor the Treasurer advised that the Division was fortunate to have received a small dividend in the previous two years from sponsored conferences (STAB2000 and Pacific 2003) but that a dividend was unlikely from Pacific 2004.

Phil Helmore
Allan Soars

Australian Division Council Membership

This is not an election year for Council, and the Nominees from each Section have remained unchanged, so the Council as a whole remains unchanged for the ensuing year.

The full composition of the Council of the Australian Division is therefore as follows:

President:	Mr R.C. Gehling
Immediate Past President	Mr B.V. Chapman
Vice-President	Dr S. Cannon
Elected Members of Council	Mr J.M. Black
	Mr W. Bundschuh
	Mr M. Seward
	Mr M. Smallwood
	Mr A.R.L. Tait
	Mr M.R. Warren
Members Appointed by Sections	
	Dr S. Cannon (Vic.)
	Mr M.J. Williams (NSW)
	Mr B.R.G. Hutchison (Qld)
	Mr G. MacFarlane (Tas.)
	Mr S. Ritson (WA)
	Mr N.P.Whyatt (ACT)
Secretary	Mr K.M. Adams
Treasurer	Mr A.J. Soars

Phil Helmore

NAVAL ARCHITECTS ON THE MOVE

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

Tony Brogan has moved on within the Det Norske Veritas organisation and has returned from Melbourne to the UK.

Graeme Collins, a recent graduate of The University of New South Wales, has embarked on a world tour and fact-finding mission. When last heard of he was in Whistler, Canada, and was finding facts about skiing rather than naval architecture! He expects to hit the UK in the later part of the year, with a view to possible work.

Gerard Engel, a graduand of The University of New South Wales, has taken up a position with Austal Ships in Fremantle. He is one of the first to undergo a new training program, working in production in the yard for a couple of months before moving to the design office.

James Fenning has moved on from Incat Designs and has taken up a position with Austal Ships in Fremantle.

Shinsuke Matsubara has submitted his ME dissertation on *A Study of the Desingularised Boundary-element Method and Viscous Roll Damping* to The University of New South Wales, and has taken up a part-time position as a naval architect with North West Bay Ships in Sydney.

Simon Robards is finishing off and writing up his PhD dissertation on *An Investigation of the Hydrodynamics of High-speed Transom-stern Vessels* for submission to The University of New South Wales. He has moved on from Spear Green Design and has taken up a position as a naval architect in the Commercial Operations Branch of the Waterways Authority in Sydney.

Tony Sammel, a recent graduate of The University of New South Wales, has taken up a position with Booz Allen Hamilton (Australia), a management/transport consulting company. His section of the company does a lot of railway and public-sector consulting (such as fares policy, organisational restructuring, etc.) His first work was for a railway operator in Queensland, and he spent four weeks in Brisbane. He is now working on a staffing model for the RAAF base at Richmond, NSW. Tony says it is not naval architecture, but it is interesting and challenging work. However, it's a big change from starting lectures at 0900 to starting work at 0630, and the daily commute out to Richmond is a grind.

Karl Slater has taken up a position in the Engineering Department (Naval Architecture) of Tenix Marine in Williamstown, Vic. Karl was previously with the Ministry of Defence — Sea Technology Group, specialising in submarine hydrostatics and hydrodynamics, in the UK.

Cengizhan Uluduz, a recent graduate of The University of New South Wales, has taken up a position as a naval architect with fledgling company R&R Watercraft in Sydney, who now have 11 m and 14 m GRP cruising catamarans on the drawing board.

Dominic Worthington continues sailing on the products tanker *Scottish Bard* to Singapore, but has been promoted and now sails as Second Engineer. He has also bought a house in Bathurst and joined the mortgage belters.

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
Samantha Tait

NMSC Supplies USL Code

The Uniform Shipping Laws Code was formerly distributed by the Australian Government Information Shops. This service ceased operations on 17 October 2003. No alternative arrangements have been made for the ongoing printing of the Code or its distribution. The new National Standard for Commercial Vessels is expected to replace the Code, but few sections have been completed, and the Code is still in force in all states.

As a service to the marine industry, the National Marine Safety Committee has provided most of the USL Code Sections (separately) in electronic (PDF) format on their website, www.nmsc.gov.au. To get to the download page, click on Site Map (*not* Publications)>National Standards>USL Code. The only section *not* downloadable is 10 (Lifesaving Appliances).

Hard copies of remaining sections are available for sale from the NMSC for $6 each. Click on Publications>USL Code for a downloadable Order Form. Sections out-of-print (and therefore not available in hard copy) are 5B (Structural Strength), 5E (Passenger Accommodation, Guardrails and Bulwarks), 5K (Fibre Reinforced Plastics), 8B (Simplified Stability Data), 8C (Stability Criteria), and 10 (Lifesaving Appliances). Orders can be made to the NMSC by phone (02) 9247 2124, fax 9247 5203 or email secretariat@nmsc.gov.au (for credit-card payments) or by mail to PO Box 1773, Rozelle NSW 2039.

Robert Skerman
Phil Helmore

Changes on NMSC

The National Marine Safety Committee has seen some changes of members recently: Matt Taylor, former CEO of the NSW Waterways Authority has retired and has been replaced by Chris Oxenbould of the Waterways Authority; Carl Kavina from Transport SA has moved on to a new job with Flinders Ports; and Sri Srinivas, of the NT Department of Infrastructure Planning and Environment has retired and has been replaced by Garry Mayer.

ABP for Recreational Vessels

Boat Builders around Australia are gearing up to meet the new Australian Builders Plate standard for recreational boats which comes into force in July next year. NMSC developed the standard in conjunction with Australia's recreational boatbuilding industry and the Australian Marine Industry Federation.

The Australian Transport Council approved the new standard in May 2003 and paved the way for the development of legislation to enable its uniform national introduction in law from 1 July 2005. Under the new standard, inadequate buoyancy will not be permitted in boats built after July 2006.

The ABP provides ready access to essential information on the use and limitations of types of recreational boats, including maximum number of persons, load, engine rating and weight, and buoyancy performance. Boats *not* required to carry the ABP include aquatic toys, pedal-power boats, personal watercraft carrying one or two persons, racing boats, sailing and rowing boats, and canoes and kayaks.

ATC Endorses Two New Equipment Standards

The Australian Transport Council has endorsed two new standards, the National Standard for Commercial Vessels, Part C Section 7A — Safety Equipment, and the National Standard for Recreational Vessel Safety Equipment. Both standards were developed with extensive public consultation. NMSC and marine safety agencies are developing legislation to allow these standards to be adopted and implemented.

New Standard for Marine Safety Administration

The NMSC has approved the development of a new standard, the National Standard for the Administration of Marine Safety (NSAMS) to replace Section 14 (Surveys and Certificates) of the existing USL Code. NSAMS will assist in promoting national uniformity and mutual recognition in marine safety administration.

Work has commenced on the NSAMS section dealing with initial and periodic surveys. A number of revisions have been proposed to the requirements for survey, including two-yearly surveys for certain lower-risk vessels, and streamlined initial-survey procedures for mass-produced vessels. The draft chapter of NSAMS will be available for public comment later this year.

Public Comment on NSCV Part E

The NMSC has called for public comment on the National Standard for Commercial Vessels, Part E — Operational Practices. This part covers general and specific requirements for vessel operation and will replace Section 15 (Emergency procedures and Safety Navigation) of the USL Code and a number of other operational requirements found throughout the USL Code.

The draft of Part E requires that all commercial vessels, as a minimum safety requirement: plan, prepare and practise for minimum emergency situations, and consider the safety implications of the operations carried out on board the vessel. It also proposes that certain vessels, considered "high risk", implement a basic safety-management system. Requirements on a minimum system are spelled out and detailed guidance is provided on recommended procedures.

A Regulatory Impact Statement, highlighting where and how the new standard differs from current operational requirements, accompanies the draft standard. Part E and the RIS can be downloaded from the NMSC website www.nmsc.gov.au, or can be sent in hard copy or electronic copy on request to the NMSC by phone (02) 9247 2124, fax 9247 5203 or email secretariat@nmsc.gov.au.

The draft of Part E is open for public comment until 31 May 2004.

Public Comment on NSCV Part C Section 4

The NMSC will soon be calling for public comment on the National Standard for Commercial Vessels, Part C Section 4 — Fire Safety. This section covers fire protection and will replace Sections 5F (Structural Fire Protection) and 11 (Fire Appliances) of the USL Code. It has been developed with input from both industry and government representatives, and is due for release for public comment in May 2004. When released, Part C Section 4 and its RIS will be available for download from the NMSC website www.nmsc.gov.au, or can be sent in hard copy or electronic copy on request to the NMSC by phone (02) 9247 2124, fax 9247 5203 or email secretariat@nmsc.gov.au.

Safety Lines, April 2004

MISSING IN ACTION

Keith Adams reports that we have only one missing soul at the moment.

He is Mr G Van Der Veen, whose last known address was 7 Howard Street, Fremantle WA 6160.

If any member knows where he is Keith would appreciate advice by telephone on (02) 9876 4140, fax (02) 9876 5421 or email kadams@zeta.org.au.

VALE CHARLES SPARROW

Charles Sparrow OAM FRINA passed away on 17 April 2004 at the age of 97. Born in England in 1906, he came to Australia with his family via New Zealand, and completed his schooling in Sydney soon after World War II. He became an apprentice shipwright at Cockatoo Dockyard, moving to the drawing office and studying for a Diploma in Shipbuilding at the Technical College. There was no diploma or degree in naval architecture available in Australia in those days and, years later, Charles Sparrow would be amongst those members of the RINA in Australia who succeeded in getting a diploma course established.

Charles left Cockatoo in 1927 and moved to Walsh Island in Newcastle for a short time. He then spent some time at Mort's Dock during the construction of the pilot steamer *Captain Cook*. Following the slim opportunities of the time, he ended up teaching in Papua for five years. He met his wife of sixty years whilst he was there, marrying before returning to Sydney and a job in the drawing office at Garden Island. He later returned to Cockatoo Island as Assistant Naval Overseer before moving to Brisbane in 1942 as Naval Overseer at Evans Deakin. His job in Queensland took him to many yards throughout the state and he had a busy and rewarding time before returning to Sydney and to Garden Island where he subsequently became Senior Naval Architect.

His eyesight began to suffer from developing cataracts and Charles retired at 60 to live on the shores of Tuggerah Lakes on the central coast of NSW. He lived there for many years doing engineering drawings for new houses and designing a number of fishing vessels and other small ships.

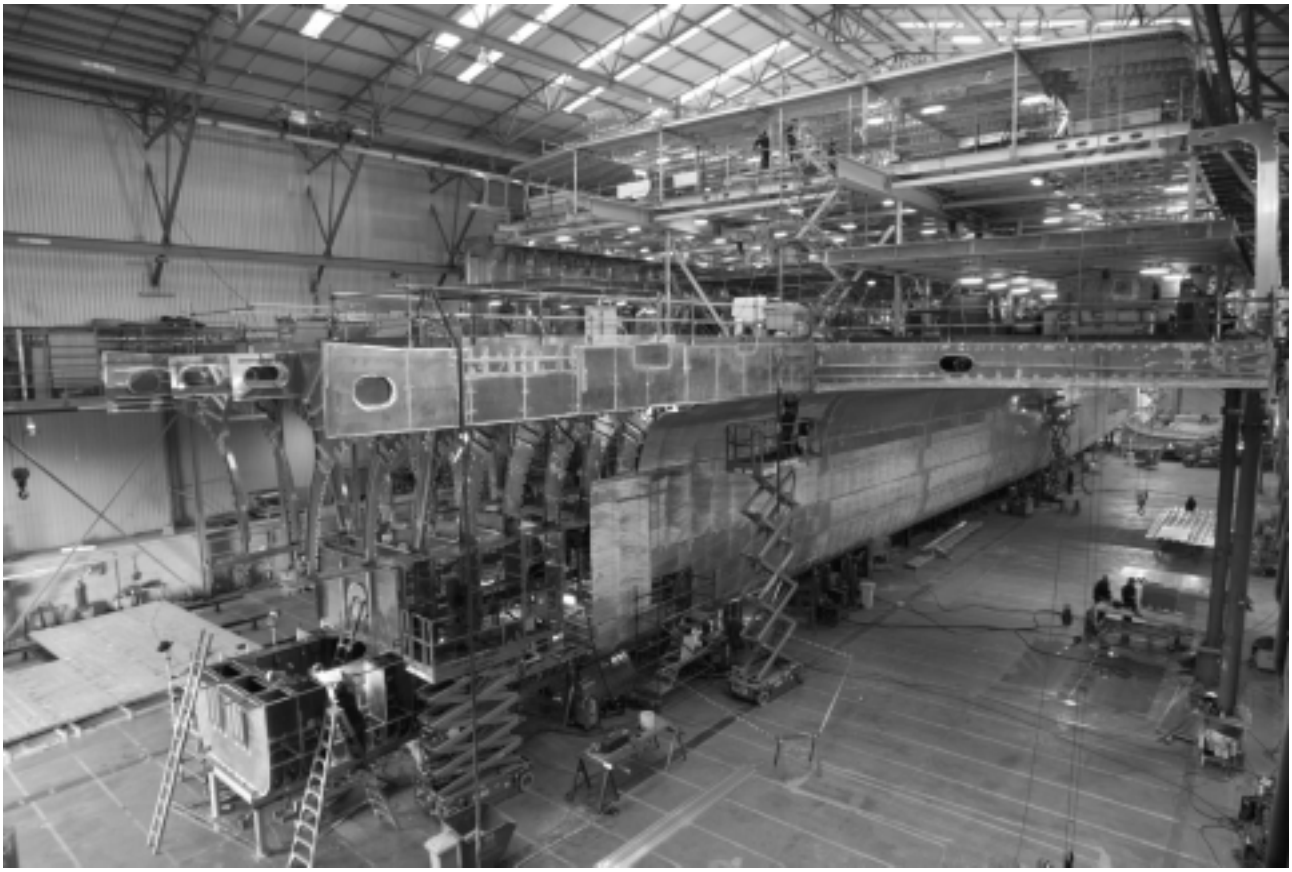
Charles Sparrow will always be remembered as the designer of the Vaucluse Junior (the 'VJ'), an affordable sailing skiff that has introduced many young people to the joys of sailing since he created the design in 1931 in the midst of the Depression. He later developed the design into a slightly larger boat, the Vaucluse Senior (the 'VS'), which became very popular after World War II.

In 2002 the Royal Institution of Naval Architects presented Charles Sparrow with a certificate recognizing his seventy years' membership of the Institution.

Charles Sparrow when at Walsh Island

Activity at Austal Ships

A recent photograph of the Austal Ships' yard in Western Australia, leaving no doubt about the varied activity at this busy shipyard
(Photo courtesy Austal Ships)



Progress on the construction of Austal Ships' Auto Express 126.6 m cargo-vehicle passenger trimaran for the Spanish ferry operator Fred. Olsen S.A. at Henderson, WA.
When completed later this year, *Benchijigua Express* will carry 1 350 passengersand more than 340 cars at speeds over 40 kn.
(Photo courtesy Austal Ships)

DEFENCE SPENDING INCREASED IN BUDGET

Additional funds have been provided for Defence in the Federal Budget tabled in the House of Representatives on 11 May. In a statement released that evening, Defence Minister Robert Hill said Defence would get an extra $1.8 billion in new budget measures over the next four years, increasing Defence's budget to $16.35 billion in 2004–05.

"The ADF's operational tempo is the highest since Vietnam and the strategic environment is far more complex," Senator Hill said.

"As well as our commitments to operations in Iraq, East Timor and the Solomons, we have to be prepared for the uncertainty driven by the proponents of terrorism.

"The 2004–05 Budget underlines the Government's unprecedented commitment to Australia's defence and national security with new spending on security initiatives, logistics and ADF personnel and family-focused initiatives." Key Budget initiatives include:

- Supplementation of $313.9 million to support ADF operations around the globe. This includes an additional $131.6 million over three years to ensure the ADF can continue its important contribution to the rehabilitation of Iraq beyond the planned hand over to the new Iraqi Government in June, an extra $20.1 million over two years for a continued ADF presence in East Timor, and $16 million to continue border protection operations.
- $326 million to buy an extra two Airborne Early Warning and Control aircraft, equipping Australia with a fleet of six of the leading-edge air and maritime-surveillance aircraft.
- An extra $54.5 million over four years to enhance Defence's counter-terrorism capabilities, including more money for intelligence and increased regional counter-terrorism cooperation.
- Funding of $13.0 million over three years for Defence to provide security support for the 2006 Melbourne Commonwealth Games.
- An extra $815.6 million over four years in logistics support for a range of key ADF platforms and equipment, including a range of enhanced maintenance work, refits and upgrades. This money will be used for enhanced maintenance, refits and/or upgrades for a range of capabilities including: Afloat Support (HMAS *Success*); Maritime Patrol Aircraft (P-3C Orions); Anzac-frigates (FFH); Training Aircraft (PC-9s); Naval Aviation (including Sea King, Seahawk and Super Seasprite helicopters and Kalkara pilotless target aircraft); Army Aviation (Blackhawk helicopters); Army Surveillance capability (Project NINOX); Army Battlefield Combat Support System (BCSS); and Transport Aircraft (C130H Hercules). The new funding also provides for the continuation through 2007–08 of the increased logistics support announced in last year's budget for the Collins-class submarines, F/A-18 Hornets, C-130J Hercules aircraft and explosive ordnance.
- A $356.5 million package to provide high-quality on-base accommodation, facilities and support and off-base rent assistance for single service men and women.
- $300 million over three years from 2005–06 to meet the increasing cost of maintaining Defence facilities such as base infrastructure, airfields and fuel farms.

Senator Hill said the 2004–05 Budget continued the Howard Government's commitment to provide the necessary leadership and funding for a strong Defence force capable of succeeding across a range of missions critical to our national interest.

"There has been no higher priority for the Howard Government than Defence in a time of great uncertainty," Senator Hill said.

"This package of initiatives continues to tackle the strategic challenges Australia faces internationally, while ensuring that we also take care of things on the home front.

"Not only are we ensuring that the ADF's platforms and equipment are reliable, well maintained and capable for operations, but we are also providing accommodation and services for ADF personnel that meet the high standards which the community expects."

HMAS *Canberra* leads HMAS *Newcastle* and ships of the New Zealand Navy from Jervis Bay during Exercise Ocean Protector which was conducted off the New South Wales coast in February (RAN photograph)

FROM THE ARCHIVES

Walsh Island Dockyard and Engineering Works

Lindsay Emmett

I feel it is important that naval architects should always be aware of Australia's rich heritage in shipbuilding. Apart from being a mark of prestige, the ability of a nation to build its own ships is a fundamental activity for a developing industrial nation, sentiments endorsed by the Governor General in his speech to Parliament in August, 1913:

"It is almost a scandal that, despite our boasted progress, the total tonnage of ships built in Australia is only about 3 000 tons. That tonnage was made up of small motor boats and ferry steamers, built almost entirely in New South Wales … Japan, Russia, and almost every great country that we can name; believe in building their own vessels for their own trade. The work is one for the National Parliament."

As early as 1909 the Federal Attorney General suggested that the Commonwealth Government acquire the Cockatoo Island dockyard in Sydney Harbour to facilitate the government's shipbuilding policy. And so, on the eve of World War I, the transfer of Cockatoo Island from the New South Wales State Government occurred in February 1913, at a cost of £867,716/9/0 ($1,735,432.90).

The sale required the State Government to acquire a new dockyard in order to build and repair its own vessels and, if possible, participate in the Commonwealth's naval shipbuilding program. The site chosen was at Walsh Island on the Hunter River. The State Government considered the location of the dockyard at Newcastle, rather than on the Parramatta River, as an advantage to avoid having competing government dockyards in the Port of Sydney. At that time, the Newcastle district was a growing centre of heavy industry, had a skilled work force, and was a source of the raw materials needed for shipbuilding.

Walsh Island was not the State Governments' first choice as a site due to the high costs of dredging. However, this factor became insignificant as the volume of shipping to and from the BHP steelworks on the opposite side of the river justified the expense. Thus in 1913 the laying of a foundation stone established the Walsh Island Dockyard as a shipyard, but not as a dockyard in the literal sense of the word.

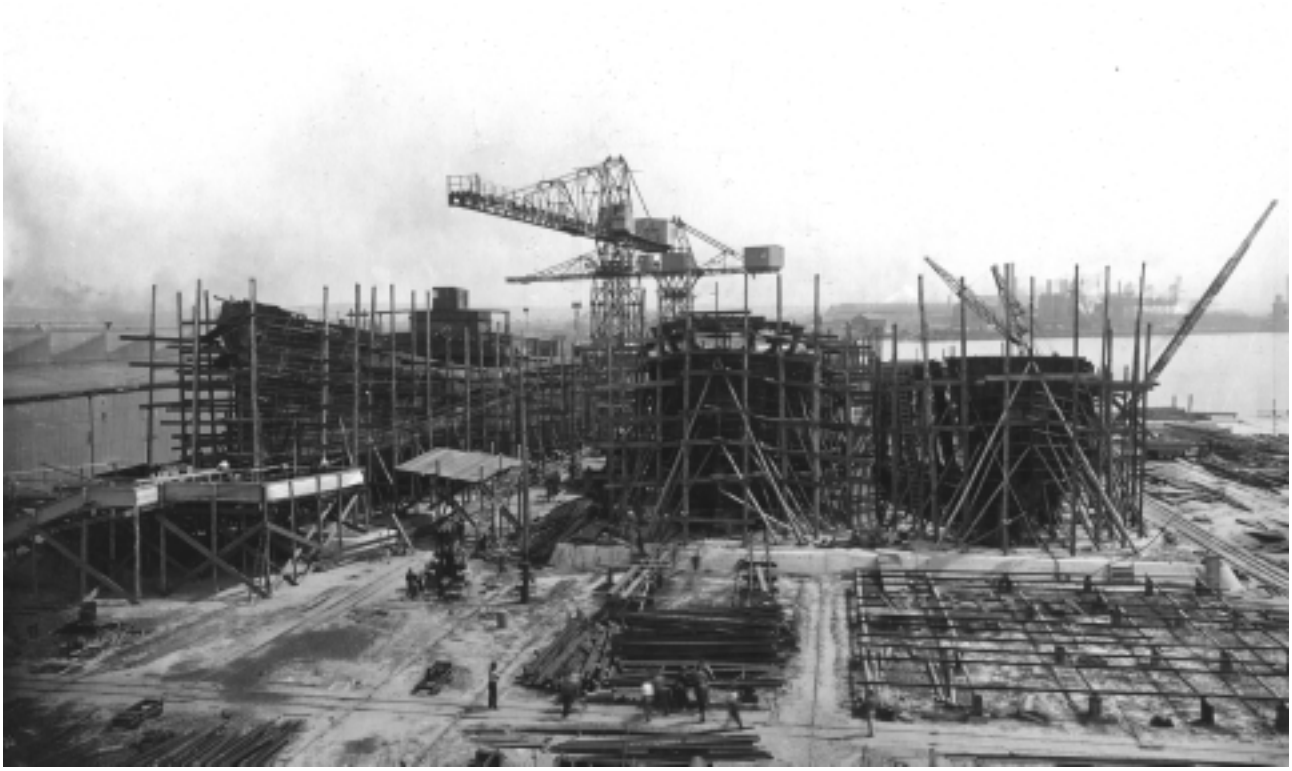
The drawing office at Walsh Island in 1920
(Photo John Jeremy collection)

The yard had three building berths, each of 6 000 tons capacity, and two patent slips capable of docking vessels of only 600 tons and 300 tons respectively. The latter were there primarily for maintaining government plant. However, one of the first initiatives was to acquire a floating dock, as the Manager stated in the Dockyard's Annual Report issued in June 1914:

"The scheme of these works includes a large floating dock, the designs for which are being prepared, and it is anticipated that the work of construction will be shortly put in hand. This floating dock will be capable of dealing with the largest vessels at present trading in these waters."

Due to many factors, the yard did not complete the floating dock until 1930. The design of the 15 000 ton floating dock was such that it was self contained and, under a naval agreement, could accompany the fleet in order to dock warships in remote parts. Another feature of the floating dock was that it could dock itself. This self-docking feature was one of the contributing factors that ultimately led to the floating dock's demise in the late 1980s.

The Walsh Island Dockyard and Engineering Works on the Hunter River in 1920
(Photo John Jeremy collection)



Three ships for the Commonwealth Line under construction on the slipways at Walsh Island
(Photo John Jeremy collection)

At its peak the yard employed approximately 2 500 workers in various undertakings, and naval architects and engineers enjoyed a wide range of challenges. The drawing office prepared designs for the construction of coasters, ferries, dredges, tugs and trawlers. However, due to the volatility of the shipbuilding industry, the yard also engaged in a variety of engineering projects, such as pumping plants, mining equipment, bus bodies, cranes, bridges, railway rolling stock, including many Sydney suburban electric rail cars. Some of our more senior naval architects in Sydney would remember the suburban electric trains as the 'red rattlers'.

One of the more interesting aspects of the Walsh Island Dockyard was that it had its own aerodrome with three runways 758 m long to enable planes to land from any direction. Also proposed was a seaplane base.

Due to the yard's relative isolation, naval architects and engineers had to be resourceful and show initiative by introducing such things as electric welding. One early project was the construction of an all-welded barge built from steel channels. The primary purpose of the barge was to transport locomotives, rail carriages, general stores and material between Walsh Island and the mainland. Naval architects also used the barge as a platform to conduct experiments in water jet propulsion.

The yard comprised several specialty areas and shops, some of the major ones being:

The Bridge Yard – This area produced many bridges of plate-and-girder, and truss-type construction.

Foundry – At 7 080 m^2 in area, the foundry was the largest in the southern hemisphere at that time, and included brass and aluminium foundries. The foundry also produced bronze and cast-iron propellers.

Two sets of triple-expansion propulsion engines in the Erecting Shop
(Photo John Jeremy Collection)

The Machine Shop
(Photo John Jeremy collection)

Propulsion and pumping machinery for a dredger built at Walsh Island
(Photo John Jeremy collection)

The launching of the Commonwealth Line cargo steamer *Eromanga*
(Photo John Jeremy collection)

Blacksmiths Shop and Forge – At 1236 m^2 in area, the blacksmiths shop had a variety of steam hammers available. This shop produced forgings, particularly for rail carriages and general engineering work.

Machine Shop – At 3 435 m^2 in area, the machine shop had all the necessary equipment for the yard's needs.

Boiler Shop – At 2 770 m^2 in area, the shop's equipment included plate benders, rolls, hydraulic riveters, shearing and punching machines. The boiler shop was capable of building all classes of boilers such as scotch, water tube and many other types.

Patent Steel Buildings Shop – Produced many small buildings made from pressed galvanised-steel sheets. The shop prefabricated the buildings for erection on site and included garages, tool sheds and small aeroplane hangers.

Car Shop – This shop produced railway rolling stock and suburban electric rail cars.

Laboratories – The yard had an extensive laboratory equipped for destructive and non-destructive testing of material, weld testing, and precision measurement along with equipment for chemical engineering and metallurgical analysis.

Given the limitations of the technology and equipment of the day, the dockyard managed to produce a wide range of products; from ships to sheds. However, in the early 1930s, the dockyard, as with many industries, began to feel the effects of the Depression. With the resulting downturn in orders, both in the shipbuilding and general engineering sectors, the Government decided to cease operations and dispose of the equipment. The dockyard remained open until 1935 undertaking dockings and minor ship repair work.

After 1935, the plant and equipment lay idle until the early

HRH the Prince of Wales about to name and launch the cargo steamer *Enoggera* on 25 June 1920
(Photo John Jeremy collection)

The Fitting-out Wharf at Walsh Island
(Photo John Jeremy collection)

1940s but, due to the needs placed on industry by the start of World War II, the Government decided to transfer much of the plant and buildings to Newcastle's Dyke End. So began the Newcastle State Dockyard Shipbuilding and Engineering enterprise, but this is another story for the *From the Archives*.

Anyone visiting Walsh Island today, now called Kooragang, will find a fertilizer plant on the site, and virtually no trace of the dockyard that once thrived there for approximately 25 years. The story of this once-proud dockyard now lives on in dusty archives, and in the memories of a few.

References

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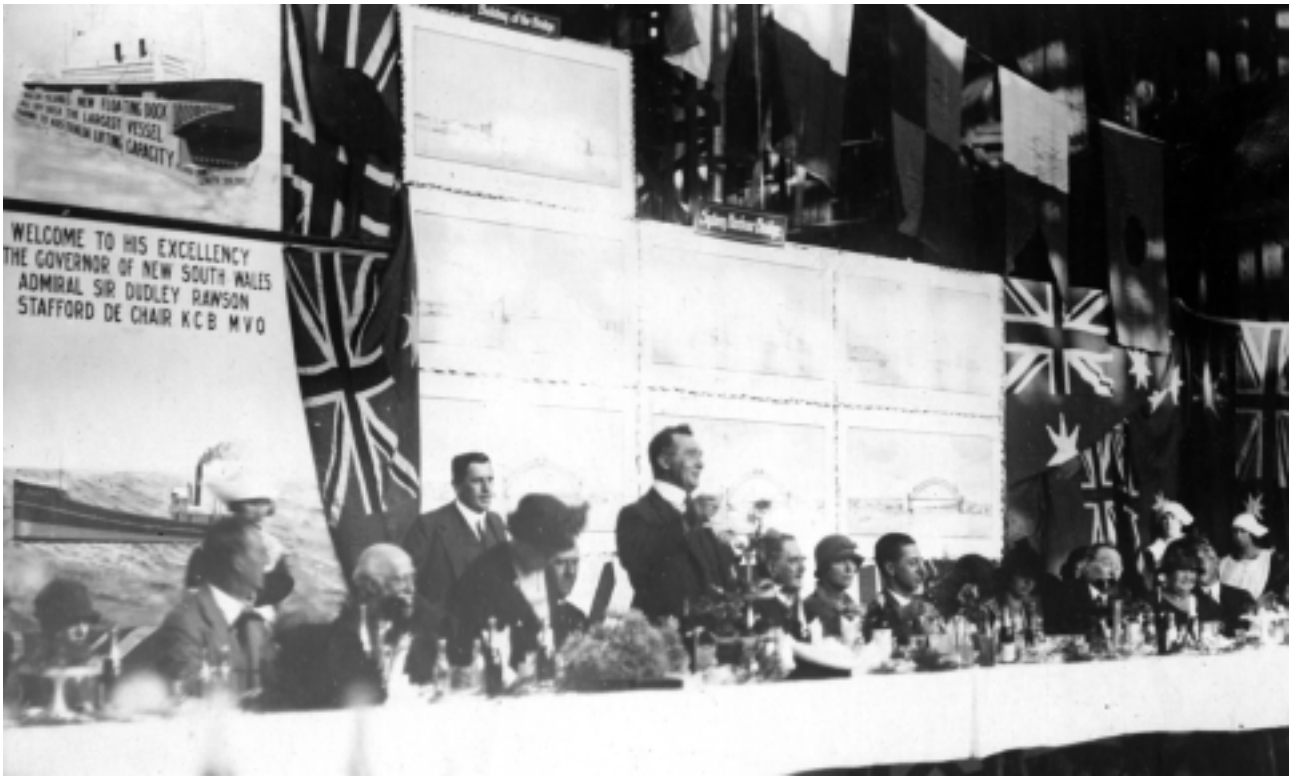
Walsh Island Dockyard and Engineering Works (1930)



Mr A. C. Waters, General Manager of the Walsh Island Dockyard, speaking at the luncheon following the launching of *Sir Arthur Dorman* and *Sir Dudley de Chair* by the Governor of NSW, Admiral Sir Dudley de Chair on 27 April 1920.
Mr A. C. Waters left a major bequest to the Australian Branch of the RINA on his death in the 1970s
(Photo John Jeremy collection)

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Wärtsilä Australia Pty Ltd, 48 Huntingwood Drive, Huntingwood NSW 2148, Tel: +61 2 9672 8200, Fax:+61 2 9672 8585