THE AUSTRALIAN NAVAL ARCHITECT

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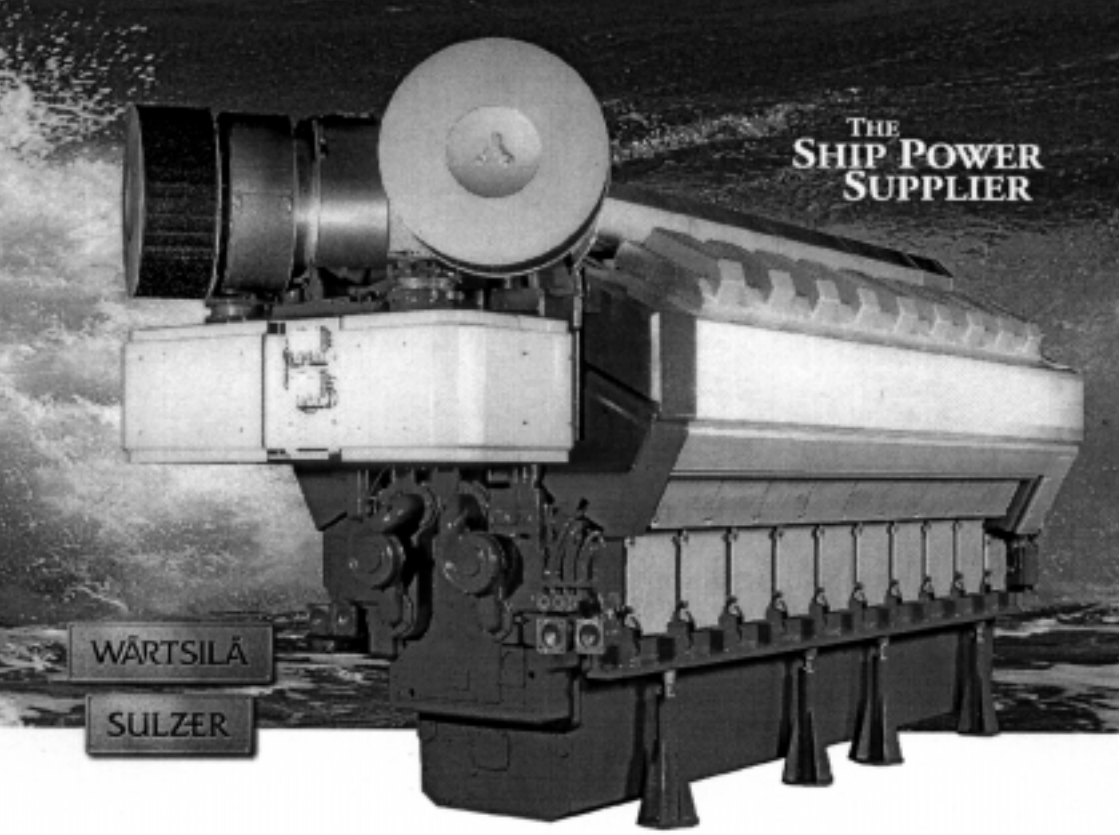

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THE AUSTRALIAN NAVAL ARCHITECT

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Cover Photo:

Solar Sailor in Wollongong Harbour during her delivery voyage to Sydney (Photo Solar Sailor Ltd)

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From the Division President

A major issue of the moment, particularly for those who work in the defence industry, is the Government's Defence Review 2000. As the Government itself points out in its Discussion Paper, which is apparently intended to stimulate public input to the defence review process, such an in-depth review of Australia's defence needs has not been done since the mid-1980s.

An important component of defence capability and preparedness is defence industry, and for the naval side of this industry this review is particularly timely. The Anzac frigate and Collins submarine programmes have already commenced their run-down phases, and it is understood that in both cases work has commenced on the last vessels. Furthermore, major contractors are already retrenching key staff, who will not be easily replaced when the next ramp-up phase commences.

As I write, I have on my desk a paper prepared over 20 years ago by Rear Admiral G. A. Bennett, sometime General Manager of Williamstown Naval Dockyard and Chief of the Naval Technical Services, on the subject *Naval Shipbuilding in Australia*. In this paper RADM Bennett argues that efficient naval shipbuilding requires:

- 'continuity of orders, with a high degree of identicality between orders;
- the timely availability of data and materials; and
- suitable facilities.'

These are not surprising conclusions, and I quote RADM Bennett primarily to make the point that people have been arguing the case for defence industry for a long time. Bennett himself refers to *The Position Paper on the Australian Shipbuilding Industry* prepared by the late Prof. P.T. Fink and R.J. Hallett in 1976 and to the history of naval shipbuilding in this country back as far as World War I.

For the last ten years or so the naval shipbuilding industry in Australia has enjoyed something approaching the conditions Bennett described. Whether they will last much longer is a moot point. Certainly the Government's Discussion Paper gives defence industry in general minimal exposure. It is not mentioned at all in the Executive Summary, and its exposure in the paper itself is not worth talking about.

The case for naval shipbuilding in Australia is not helped by the bad press being received by the Collins class submarine project. Some of the criticism appears to be not unwarranted, but it would have been nice to see equal air time being given to recent events where HMAS *Waller*, an unmodified Collins class boat, was twice able to penetrate US Navy defences and position itself to attack key fleet units during RIMPAC 2000. If this submarine is indeed as 'noisy as a rock band' then the USN must have some hearing problems! It should also be noted that Australia is not unique in having a major defence design-and-construct project run over budget. In comparison with some projects elsewhere, the problems of Collins are down in the nuisance class.

RINA Australian Division will be making a submission to the Defence Review arguing the case for the defence shipbuilding industry. This submission will include and enlarge on the points raised above. The Division Council will also be looking for ways to support the submissions of other bodies such as IEAust to ensure that the case is put with the maximum strength possible. In the view of the Council, a sound defence shipbuilding industry is an important component of the national defence. To allow it to wither as a result of Government or community shortsightedness or inability to make the hard decisions will be a case of gross negligence.

Bryan Chapman

The Australian Collins class submarine HMAS *Waller* arriving at Pearl Harbour for the first time on 28 May 2000 (right). *Waller* was one of several RAN units participating in the major naval exercise RIMPAC 2000 (RAN Photograph)

Editorial

On 25 June I joined a large crowd of people gathered at the Australian National Maritime Museum at Darling Harbour to welcome *Solar Sailor* to Sydney. This interesting craft is the brainchild of a NSW South Coast medical doctor, Robert Dane, and was built with the help of a $1 million grant from the Commonwealth Government through the Australian Greenhouse Office. Dr Dane's statement that 'we have in *Solar Sailor* something that no-one has done before — a boat which needs only a combination of the wind and the sun for power' perhaps went a bit far, noting the surrounding sailing ships like *Batavia, Endeavour* and *James Craig*. They were (and are) solar powered — perhaps the innovative new ship is better described as 'a return to solar power.'

The event certainly highlighted a challenge that lies before us in the 21st century — to develop new and sustainable sources of power, for our supply of fossil fuels must in time run out or become prohibitively expensive. Eventually, man may look back on the 20th and 21st centuries as a time of great waste of scarce resources. Just how the challenge will be met is a bit hard to determine now. Perhaps *Solar Sailor* does represent a path to the future, noting that the consensus seems to be that we must reduce greenhouse emissions, and nuclear energy suffers from other perceived environmental difficulties which suggest that it will not have widespread application.

One thing is most probable. The contrast between the technology of one hundred years hence and today will be as dramatic as that represented by *James Craig* and *Solar Sailor*. It seems to me that there is plenty of interesting and satisfying work ahead of new generations of engineers and scientists, and Australia must surely benefit from this work if we are bold enough to make the best use of our many talents.

Once again looking to the future, with this issue of *The Australian Naval Architect* we welcome Wärtsilä NSD on board as sponsor of our Journal. *The ANA* is becoming an important part of the activities of the RINA in Australia, and support such as this is highly valued and much appreciated.

This edition is another large one and, as editor, I definitely prefer to have to decide what is to be left out, rather than have insufficent material. The contributions sent to Phil Helmore and myself are greatly appreciated, and we always want more news of the activities of naval architects throughout Australia. Please keep them coming.

John Jeremy

Letters to the Editor

Dear Sir,

We have moved into the new millennium with what seems like a bright future for the maritime industry in our country. Yet at the same time, 30 June 2000 saw what was perhaps a step backwards as far as assuring that future, for this was the wind-up date of the Australian Maritime Engineering Cooperative Research Centre (AME CRC).

When AME CRC was established following a commitment of Federal Government funding in 1992, it seemed like the best prospect for making a significant advancement in the expertise of the Australian maritime industry. But now, less than a decade later, AME CRC has disappeared following the withdrawal of funding support by the current Federal Government.

So what were the positive aspects of AME CRC?

- It provided a means for the coordination of maritime R&D efforts in Australia.
- It extended the options for cooperative R&D efforts between academic institutions, between these institutions and industry and even between the participating industrial organisations. This set the opportunity to take full advantage of the diverse skills that are available in academic institutions and industry throughout the country.
- It provided a means for the Federal Government to support the development of a sustainable industry rather than just propping up this sector with subsidies and bounties which are less likely to be re-invested into future growth.
- It gave the opportunity for further education of the Australian maritime community through workshops, conferences, postgraduate scholarships and other such initiatives.
- It resulted in numerous good-quality and practical technical reports.
- It performed a limited amount of consultancy work, which has had spin-offs that are still apparent today.
- It had the potential to help forge closer links between industry participants in areas other than simply R&D.
- It has left a legacy of valuable testing infrastructure in this country which will hopefully continue to be effectively utilised.

If anyone is brave and persistent enough to try to establish a new-generation maritime CRC, what lessons can they learn from the failure of AME CRC? There are probably many and diverse viewpoints on this, but listed below are some which I have gained from staff formerly employed by the CRC, from colleagues in the private and public sectors and academia as well as my own views:

1. The original submission for the formation of a maritime-related CRC was limited to activities related to applied hydrodynamics. At that stage the focus was tight and the scope was manageable. On the formation of the CRC and over the subsequent years, AME CRC activities expanded into many areas. While this may well have seemed a necessary measure to warrant a CRC, it also appeared to dilute expertise and spread resources too thinly across the wide range of topics which were taken on. Perhaps this also resulted in a loss of focus on the direction of the CRC's research efforts.

2. The funding arrangements for the CRC seemed to be too loose with the Federal Government providing the only continuous and predictable stream of significant funding. When this was withdrawn, there was no adequate industry funding to fall back on to allow research efforts to be scaled back but still continue.

3. I never considered the mere attendance of industry participants at AME CRC sub-program meetings and the like to have constituted in-kind contributions. Real in-kind contributions would have been in the form of active participation in research work, supply of test or trials data and the like. It would have been preferable for industry contributions to be monetary in the first instance and then adjusted depending on the degree of real technical contributions such participants made to the CRC.

4. Towards the end of its life, the CRC may have been too pre-occupied with 'soul searching' activities. The moderate but steady stream of research reports that we received from AME CRC all but dried up in the last year or two be-

fore government funding was withdrawn. Some supporting industry participants must have been left wondering whether the CRC was still making progress with any of its R&D efforts.

5. There seemed to be a general consensus from all sides that AME CRC was becoming bogged down by administration and that this was increasingly eating into its limited financial resources which were intended for R&D work. Of course, this does not mean that the CRC could have operated without good administrative arrangements; they simply needed to be as efficient and unobtrusive as possible.

6. In some instances the CRC research efforts seem to have been over-sold. Australia can not expect to become a maritime R&D leader over-night and we should have been happy to remain humble while we developed our expertise.

7. It seems that industry also didn't have a clear idea of how the CRC could be effectively utilised. There were instances where it was intended that the CRC would be used as little more than an engineering service provider, a task that any competent consulting naval architecture company could have performed. I have shared a few laughs (and tears) with friends in the CRC over the apparent lack of understanding that some 'management types' seemed to have had over the objectives of a CRC.

8. Some sectors of the industry appear to have the attitude that they know best and don't need help or advice from a CRC. At one CRC sub-program meeting some industry participants seemed more interested in getting a slice of the CRC financial pie by acting as consultants rather than adopting a cooperative attitude to the research effort where they too could learn from the expertise of others.

9. The technical committee did not communicate well with the industry participants. It seemed like a proposal for an R&D project would be carefully prepared and submitted only for it to be turned down without any feedback of the outcome, let alone the reasons.

10. The CRC was not properly geared for seeking out and winning commercial consultancy work. For the industry it was more straightforward and cost-effective to deal directly with the commercial arms of the separate tertiary institutions involved in the CRC, or to arrange such work directly with the most suitable industry participant, rather than through the CRC.

11. Perhaps the AME CRC researchers could have made greater efforts to understand the needs of the industry and identified areas of weakness where R&D activities would have been effective. This also applies in reverse and the industry could equally have capitalised on practical research efforts already under way within the CRC.

12. There seems to be greater cooperation between industrial organisations across the whole of the European Community that we have been able to achieve in our small sector of our modest country. This may have been the greatest single difficulty that the CRC was faced with. I am not sure if our industry accepts that there is strength in numbers and that a more cooperative approach to maritime R&D can benefit the Australian industry as a whole. The concern seems to be that such co-operative research is likely to disadvantage the organisation you are in and advantage all the others.

The Australian Maritime Engineering CRC has ended. However we have hopefully all at least learned some lessons on how and how not to undertake co-operative R&D in Australia. Now, how will we go forward and capitalise on all that Australian innovation which was apparent in recent issues of the ANA?

Martin Grimm

Dear Sir,

Martin Grimm has noted that 30 June saw the passing of the AME CRC. I also would like to note the passing of this date and, for the sake of history, make some observations.

The AME CRC was probably never going to be able to work, because of several factors:

1. AME CRC was set up to serve the maritime industry, but this 'industry' is so diverse that AME CRC lacked focus. The skills of available researchers were limited to certain specific areas, and it was not possible to serve the whole industry with limited research resources. Attempts were made to focus on a few specific tar-

get niches in the maritime industry, but these niches were (in the world scheme of things) very limited industries.

2. The activities were geographically too widely spread. This led to regional factionalism and infighting.

3. The role and needs of industry was never adequately understood by any of the 'sides' in the cooperative.

4. AME CRC was largely set up by academics who did not understand industry, and what its needs were.

5. Academia tried to take too much for themselves out of AME CRC. As a consequence of this, AME CRC was largely academia-driven, whereas it might have had more success if it had been industry-driven.

6. Because of its high profile, there were expectations that the fast-ferry industry had a part to play in AME CRC, but there were a substantial number of factors that were always going to exclude the two sides from coming together:

(a) The quality of researchers in AME CRC was not seen as adequate by the industry, who had already absorbed most of the available graduate skills.

(b) The fast ferry industry (in particular) did not trust academia and, consequently, did not want academia in control of research moneys.

(c) The fast ferry industry was expanding and was very self-assured (cocky, even). Cooperative research was seen as a waste of time and money. Money could be better spent by giving it directly to the shipyards. And of course that is exactly what happened.

(d) the fast ferry industry had got where it was because of certain individuals. Technology was not a main reason for the current success. Why then was it necessary to include technology and research? It should be remembered that this was very early in the life of this industry, and there appeared to be no need for substantive amounts of research at that time.

(e) AME CRC never appreciated how to play what became a political game, with the fast ferry industry having some powerful connections in Governments. At the end of the day, they were able to get their opinions across far better than were AME CRC. Some of the research money (and more) that AME CRC received, now goes directly to the shipyards via the Shipbuilding Innovation Scheme (SIS).

In summary, AME CRC was doomed to failure because it was never truly cooperative. It was not cooperative with the industry, and it was not cooperative within its own structure. But what we have now, from a fast ferry industry perspective, is a scheme that is probably much more effective. The industry is spending a considerable amount on research, and the development of new ideas. Last year's R&D claims under the SIS were of the order of tens of millions. How much of an incentive the AMECEC was, we shall never know.

Tony Armstrong

Dear Sir,

The Perth Research Core celebrated the demise of the Australian Maritime Engineering CRC with a wake, which comprised the reading of 'An ode to AME CRC' subtitled 'The green tail of the little yellow ROV' (viewable on the Centre for Marine Science and Technology's website, physics.curtin.edu.au/dept/amewake) and the ceremonial burning of a cardboard catamaran on the campus lake. Affairs were presided over by the incumbent Regional Manager, The Gnome, who was the driving force behind the Perth Core in its final year of operation.

The Gnome is a 1.3 m high garden gnome which, as Regional Manager, I presented to the Perth Research Core in March 1998 to look after things whilst I was away for a year. The Gnome performed his role very well, never overspending his budget and contributing to the team effort in developing new initiatives, although he experienced difficulty making his presence felt at meetings due to being linearly challenged. In March 1999 it was decided that there would no longer be any Regional Managers, and at this The Gnome took umbrage, as it placed him in gnome an's land, career-wise. However, being thick-skinned (30 mm of plaster), he ignored this directive and continued in the RM position, unpaid. Attempts were made to obtain funding for his role, but the correct category of expenditure

could not be found — *Garden ornaments, various* somehow didn't seem appropriate for a marine research centre. And so The Gnome has joined the ranks of the unemployed, but is seeking gainful employment in the marine industry, offering a depth of expertise in research management, naval architecture and the promotion of cooperative research. It is rumoured that he has his eye on the job of Head of the Royal Commission into SOCOG Corruption, starting in October.

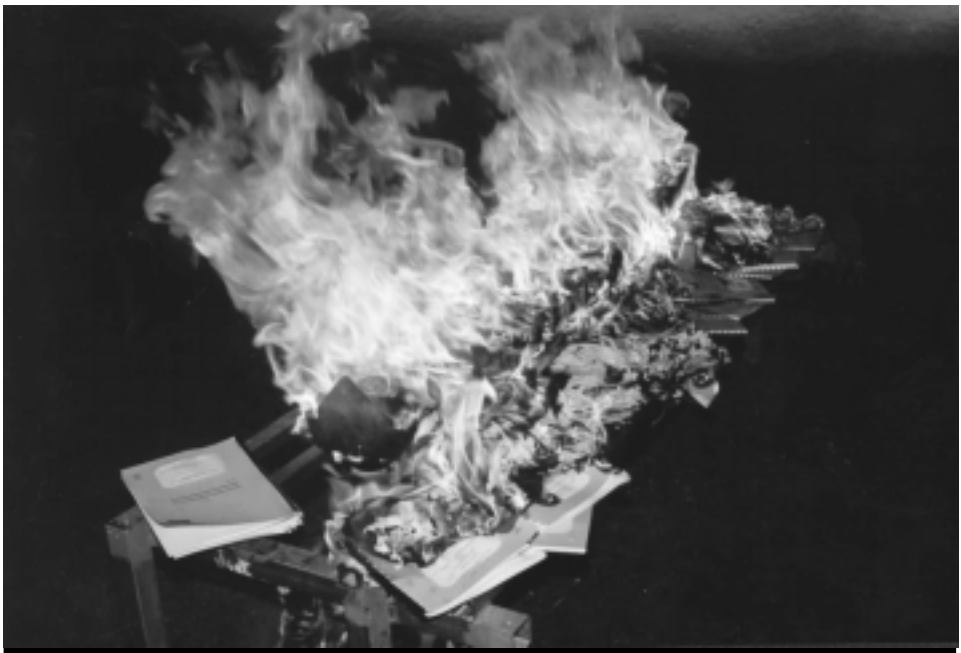
Kim Klaka

Dear Sir,

The Launceston Research Core celebrated the demise of the Australian Maritime Engineering CRC with a wake, which comprised a funeral pyre at 6 pm on 30 June, the last day of operation. The foundation of the pyre was the very first model built and tested for the AME CRC, Model 01 from the High Speed Displacement Hull Form Systematic Series, as it was in very poor condition and thus was replaced with a good model a number of years ago. The model was then surrounded by a pile of Internal Reports which would otherwise have been shredded. The ashes from the pyre have been stored in an urn and will become the prize at the next AMC Towing Tank cricket match. The burning was done with the utmost of safety, as all onlookers were armed with cups of liquid in case things got out of hand. Fortunately this was not the case and the liquid was disposed of in a more thoughtful manner.

Gregor MacFarlane

Vale AME CRC at Launceston (below)



NEWS FROM THE SECTIONS

New South Wales

The NSW Section Committee met on 17 August, after the presses had started rolling for this issue of *The ANA*. Its deliberations will be reported in the November issue.

Selwyn Oliviera of Alfa Laval gave a presentation on *Innovation in Separator Development* to a joint meeting with the IMarE attended by twenty-five on 24 May at Eagle House. Selwyn invited his audience to step into the future as he described what he called 'the perfect solution' for cleaning oils of all types: the new, highly compact Alfa Laval separation unit. This unit was first introduced in June 1999 and was exhibited at the recent Pacific 2000 Exhibition in Sydney. From a design point of view, the height of the new separation unit has decreased by 40%, its width has been reduced by 50% and its weight by 75%, making it significantly more compact than previous or competing units. The installation cost is expected to reduce due to its 'plug and play' concept. The unique bowl design enables longer service intervals, which lowers operating costs and Alfa Laval claims that the unit opens up new horizons for separation efficiency. This new equipment is of interest to both designers and operators.

Peter Dalley of Port Marine gave a presentation on *Controlling the Effects on the Environment by Minimising Waste Water* to a joint meeting with the IMarE attended by twenty-eight on 28 June at Eagle House. With the increase in standards for the marine environment, new equipment has been designed to enable ships' staff to operate the equipment in accordance with the standards set by IMO. Peter began his presentation by showing MPG movies from his laptop computer of the latest in rotary-jet tank-cleaning equipment on ships and in breweries. As an example, the cleaning time for a yeast tank at a brewery was reduced from 24 to 2 hours, and the water usage from 100 000 to 1 000 litres. He described some of the various modules that can be used to operate shipboard equipment within the standards for ship discharges into the ocean. Port Marine manufacture in Sydney the Rochem DT (Disc Tube) reverse osmosis machines supplied to the RAN and installed on many naval vessels, all the Anzac-class frigates, the minehunters, and some patrol boats to desalinate seawater for domestic use. One of the latest developments is the FM UF membrane filtration module. This module can be used for ultrafiltration (in both cross flow and dead end applications), nanofiltration, low pressure reverse osmosis, and now with the the Bio-Filt Reactor to purify black and grey sewage water. A residence time of around two hours is all that is required to purify the resultant permeate to a standard that can be reused for flushing toilets, laundry, deck cleaning and other uses, minimising the size requirement and the load on the desalination system. Besides being designed into new tonnage, the modules can also be retrofitted. A ship using salt water for toilet flushing can be retrofitted with a Bio-Filt system and the ship's existing system changed to flush with permeate fresh water, reclaimed from the Bio-Filt unit, with minimal modification to the vessel's existing systems or equipment.

Alan Haywood of Maritime Dynamics Inc. gave a presentation on *Ride Control Systems* to a joint meeting with the IMarE attended by forty-six on 26 July at Eagle House. Alan began his presentation by outlining the history of ride control systems (RCS), which began with the US Navy applying them to SES craft in 1981 and 1982. This was followed by their application to commercial SES craft. In 1990 they were first applied to a catamaran, *Condor 9*, after her withdrawal from service after four sailings due to excessive motions. MDI developed a RCS for her and she returned successfully to service. These were followed by the first RCS on a monohull vessel, *Superflyte*, in 1993; the first T-foil on *Condor 10* in 1993; the first breakaway T-foil on the FBM tricat in 1994; the first RCS on a yacht, *Nowacka*, in 1996, and the first retractable T-foil (which stows clear of the water behind the centre bow when not in use) on the 96 m Incat wave-piercer *Milenium* in 2000.

There are four possible elements in a modern RCS: trim tabs, T-foils, cantilever fins, and interceptors. Trim tabs generate lift by modifying

the flow under the lower surface. They can control pitch and roll (and some heave) on monohulls and catamarans, and are effective between 20 and 60 kn. T-foils generate lift from the pressure differential between the upper and lower surfaces. They can control the pitch and heave on monohulls and, additionally, the roll on catamarans, and are effective between 25 and 50 kn (the upper limit being due to cavitation on the foil). Cantilever fins are placed approximately normal to the hull and generate lift from the pressure differential between the upper and lower surfaces. They can control the pitch and heave on monohulls and, additionally, the roll on catamarans, and are effective between 25 and 50 kn. Interceptors are basically retractable flat plates placed normal to the flow, and generate lift by altering the flow along the hull. They are easier to fit than trim tabs, lower in weight, and require less power to operate, but are less effective. Combinations of each of these elements can be installed on any vessel. A combination of T-foils and interceptors would perform similarly to T-foils and trim tabs; however, on their own, trim tabs are more effective than interceptors.

MDI have developed their own in-house program based on strip theory for ship motion prediction with and without RCS, and now includes monohulls, catamarans, wave-piercers, SES craft, SWATH vessels, etc. They have also conducted extensive tank tests and full-scale trials, and find that their predictions correlate well with experimental results. The prediction of motion sickness incidence (MSI) is of primary concern to passenger ferry operators.

Gazing into the future, Alan outlined the advantages and disadvantages of the coming generation of RCS elements: retractable T-foils, retractable low aspect-ratio fins, and full-span lifting foils. Ride control systems have played a large part in the success of fast ferries in the past decade, and advances in ship design are likely to be met with advances in ride control.

Phil Helmore

ACT

The ACT section held its annual general meeting on 25 May.

The new Section committee is:

Chairman	Mr Ian Laverock
Vice Chairman	Mr Dave MaGill
Treasurer	Mr Nick Whyatt
Secretary	Mr Bruce McNeice
Assistant Secretary	Mr Martin Grimm
Other Members	Mr John Colquhuon
	Mr Robert Thomson
	Mr Tim Lyons
	Mr Rob Gehling
	Dr Warren Smith

All ACT section members should note that the Chairman, Ian Laverock, is unable to continue in that position after August. A replacement for this position on the committee is urgently sought. Meetings for the year were discussed at the AGM and a number of meetings have been scheduled for the first quarter.

On Wednesday 26 July Robert Dunbar, the Australian Marine Technologies (AMT) Engineering/Design Manager from their Ship Design Office in Melbourne, presented a paper to a combined meeting of twenty-six RINA, IMarE and MARENSA members at Engineering House in Barton. The paper titled *Anzac Ship Design Development*, reviewed and discussed aspects of the design development with various examples including the mechanisms, skills and relationships between the major players in the ANZAC program. Mr Dunbar covered the process of design development and the various contracts leading to the award of the final design-and-construct contract, emphasising the project management lessons learnt along the way.

The presentation had the goal of reinforcing the view that the study of history is a vital input to our future; all the more vital if we seek to effectively maximise indigenous involvement in and influence over the next major surface combatant.

Of note was the opinion, from the designer's point of view, that it would have been advantageous for the customer to become more involved in the early design stage. Mr Dunbar felt that the customer took too great a 'stand-back' approach. This was different to the experience

Blohm & Voss had with other clients for their naval ships. The audience speculated that there were many reasons for this, one suggestion being that they were reluctant to accept responsibility for design decisions, preferring the contractor to accept the responsibility and associated risk.

Another surprise to the designer was that the customer did not utilise an independent third party to review the design and construction. Other customers, the Federal German Navy for instance, used Germanischer Lloyd for this duty.

It was highlighted that there were a considerable number of equipment changes made during and after contract signing. These sometimes had unexpected implications for the design, at times causing the design to lag the construction program that was being held to a tight schedule. Occasionally this resulted in rework being required. As a result of these changes it was noted that the ships should be considered as a new class and not 'built to plan'. The Anzac does not represent a copy of the baseline Portuguese Navy MEKO 200. In discussion, Tim Lyon pointed out that the only significant change the customer had sought was the upgrade to a 127 mm gun rather than the originally-proposed 76 mm. The other design changes were largely contributed by the builder.

Mr Dunbar also suggested that the customer should consider incremental ownership rather than the turnkey approach that was taken. Some discussion took place regarding who should have responsibility for managing the overall impact of all the changes to the 'baseline' design . Concluding the presentation and discussion, RADM Bill Rourke, RAN (retd) offered a vote of thanks to Mr Dunbar for a very interesting paper.

Bruce McNeice

Queensland

The Queensland Section had its quarterly combined Section Committee Meeting and Technical Meeting at Yeronga Institute of TAFE on June 6. These meetings were ably chaired by Stephen Plummer due to the unavailability of the Section chairman.

The Section Committee addressed the matters of increased membership, new goals for 2000/2001, progress with the development of the Advanced Diploma of Engineering (Naval Architecture) in Queensland and matters outstanding from the Australian Division Council Meeting of 22 March. The meeting was short and purposeful.

The technical presentation was given by Terry Davis, Production Manager of Noosa Cats Pty Ltd, on the subject of *High Speed Offshore Catamarans.* This meeting attracted twenty-four members and visitors who were in no way disappointed with the evening's presentation and the follow-on question time. Terry gave the meeting some history of Noosa Cats telling how the popular Noosa Cats have developed over the years by some trial-and-error but more importantly with some well-directed research into design, construction and production techniques with follow-on trials and evaluation. Question time was long with many related questions being asked by the meeting.

It is with much regret that we advise that Jacqui Rovere has resigned from the Queensland Section Committee in order to move on to other things. Jacqui's contribution will be sadly missed; however Ross Burchill has offered to take Jacqui's place, so we can look forward to his committee involvement in the future.

Brian Robson

Victoria

The presentation of papers to joint meetings of RINA and IMarE continued on the usual third Tuesday of each month.

On 16 May Dr Craig Gardner presented a paper on *Corrosion Modelling for Large Vessels* covering the main aspects of research work at the University of Newcastle (NSW), supported by BHP, on fundamental aspects of the occurrence and characteristic behavior of corrosion in bulkships.

A seminar on *Yacht and Small Craft Propeller Designs* was held on 20 June. Mr Wayne Hawk of Seahawk Pty Ltd (Victoria) described the origins, principles and present status of Austostream

self-feathering pivoting-blade yacht propellers. Another local firm, Tristream Propellers was represented by Mr Michael Mousley who described their folding design of low-drag yacht propellers. Danish Gori folding propeller types were covered by brochures from Power Equipment Pty Ltd. Co-ordinator Ken Hope passed on information from Rob Lettini about Tristream's activities in fast ski-boat supercavitating propellers used in Murray River races at speeds up to 118 km/hr (64 kn). Actual folding and ski-boat propellers provided for inspection by Seahawk and Tristream prompted much interest.

On 18 July a presentation by Mr G. Hooft of the Australian Marine Oil Spill Centre described the events following the serious oil spill on Sydney Harbour from the tanker *Laura d'Amato* on 3 August 1998. The description and the accompanying videos brought home both the success of the spill clean-up operation and the extent to which the harbour terrain assisted with the containment of the spill.

Ken Hope

Western Australia

The Western Australian Section has continued to hold regular monthly technical meetings at the Flying Angel Club in Fremantle. Attendance numbers have been disappointing to the committee, although it is noticeable that different persons attend different meetings, so the level of interest from members possibly remains high.

On 17 May Tony Armstrong gave a talk on *Modifications to IMO's High Speed Craft Code*, and which had been agreed in London only a few hours before. An audience of approximately thirty six, including about fourteen non-members, heard about the changes that have been made in all the areas of safety, with some detail being presented on the new damage stability requirements that are going to have a significant effect on our current designs.

Dave Gravenall of Tenix gave a presentation on 27 June on *The Search and Rescue vessel for the Philippines Coastguard*. This paper was very much up-to-date, as trials had only been conducted a few days previously, and the vessel was to be handed over on the following day. It was also of particular interest because it saw the completion of the first vessel of a project that has had a long gestation period of almost nine years. A video was shown of the trials and interior layout of the vessel, including the launching and recovery under way of the smaller rescue boat carried at the stern. Thanks are due to Martin Hartmann for arranging the presentation.

On 20 July the Section held a forum on *Professional Development for Naval Architects*. A panel of experts representing the viewpoints of industry, academia and the graduate naval architects presented their ideas on the need for professional development and the advantages that this offered to both the employer and the employee. This was a useful interactive session with many questions and opinions coming from the audience, which was largely made up of young naval architects from the high-speed ferry builders. There were seventeen attendees in all, and those who didn't come missed out on an interesting and useful evening. It is intended to compile a report on the issues coming out of this meeting, with a view to discussing them with some of the major employers of naval architects in Western Australia.

The Ausmarine 2000 Conference and Exhibition is being held in Fremantle in November, and the Western Australian Section will have a joint stand with IMarE at the exhibition, kindly provided by the organizers, Baird Publications. We will also be arranging a half-day mini-conference running in parallel with Ausmarine with a provisional theme of *Practical Hydrodynamics* on Thursday 2 November, from 1 pm to 6 pm, with dinner afterwards.

The committee will meet with the branch committee of IMarE in the next few days to explore the possibility of holding joint meetings and the potential for closer co-operation.

Tony Armstrong

Fremantle,
Western Australia
31 October - 2 November 2000

AUSMARINE 2000

AN INTERNATIONAL EXHIBITION AND CONFERENCE FOR THE COMMERCIAL AND MILITARY MARINE INDUSTRY

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IF YOU'RE A COMMERCIAL OR MILITARY MARINER YOU CAN'T AFFORD TO MISS AUSMARINE 2000

COMING EVENTS

NSW Section Technical Meetings

Technical meetings are generally combined with the Sydney Branch of the IMarE and held on the fourth Wednesday of each month in the Harricks Auditorium of the Institution of Engineers Australia, Eagle House, 118 Alfred St, Milsons Point unless notified otherwise. They start at 5:30 pm for 6:00 pm and generally finish by 8 pm. The revised program of meetings remaining for 2000 is as follows:

23 Aug	George Spiliotis, Germanischer Lloyd (Australia), *Application of Class Rules for WIG Craft*
27 Sep	Tomas Hertzell, ABB Alstom Power, *Experience with the GT35 Gas Turbine in Marine Propulsion*
5 Oct	Ship visit to *Incat Tasmania*, Darling Harbour, noon-1530. Please RSVP to Lina Diaz on 9212 4588 or email lina.diaz@au.bureauveritas.com.
25 Oct	Neil Edwards, Adsteam Marine, *Design and Construction of 62 t Bollard Pull Tugs*
** Nov	SMIX Bash/Annual Dinner
**	Date to be advised. Local members will be advised via the usual email; if written advice required, then please advise Jennifer Knox, on 9979 9815.

Queensland Section Technical Meeting

A Queensland Section technical meeting will be held on 5 September at Yeronga Institute of TAFE commencing at 6.30 pm. The technical subject of the meeting is undecided at this stage but will probably be a *Getting to know your Business* meeting where a number of members will be asked to give a ten minute presentation about themselves and their business. Visitors are most welcome.

Victorian Section Technical Meetings

19 Sept	Bob Herd, *Sail training vessels — subdivision and stability aspects*.
21 Nov	Denis Pratt, ProMarine Ltd, *ProMarine aluminium fast workboats*

ACT Section Technical Meetings

26 July	Robert Dunbar, Design Manager, Australian Marine Technologies, *ANZAC Ship Design Development*,
17 Aug	Phil Brown, Tenix, *The Philippine Patrol Boat*.
6 Sept	Rob Gehling, AMSA, *Design and Construction of Oil Tankers — Time for Change*.

Times and locations of meetings may be obtained by contacting the Section secretary Bruce McNeice by telephone (02) 6266 3608 or by email to bruce.mcneice@cbr.defence.gov.au.

AusMarine 2000

The fourth AusMarine conference, to be held at the Overseas Passenger Terminal in Fremantle, WA, on Tuesday 31 October to Thursday 2 November, will be entirely focussed on practical and real issues in the commercial marine environment. The conference is specifically designed and planned to feature industry people discussing real problems and practical solutions. The associated AusMarine exhibition will be located downstairs from the conference, and will be open from 1000 to 1800 on each day of the conference. Further information can be obtained from the conference and exhibition director, Baird Publications Pty Ltd, 135 Sturt St, Southbank, Melbourne, Vic 3006, phone (03) 9645 0411, fax 9645 0475 or email marinfo@baird.com.au.

RINA at AusMarine

The Western Australian Section of RINA is organising its own mini-conference in association with AusMarine 2000 in Fremantle, on the theme *Practical Hydrodymanics*. Further details may be obtained from the Chair of the WA Section, Tony Armstrong, phone (08) 9410 1111, fax (08) 9410 2564 or email tonya@austal.com.

MarTec 2001 Conference

The Australia/New Zealand Division of IMarE will host the third international maritime conference at the Plaza International Hotel, Wellington, New Zealand, from Monday 19 to Wednesday 21 November 2001. The conference is being organised by the Wellington Branch in conjunction with the Sydney Branch. The theme of the conference will include latest developments, high-speed craft, fishing vessels, yachts and all aspects of the marine industry. Details are being developed; watch this space. Further information may be obtained from Mr Barry Coupland, phone +64-4-385 0408, fax 385 9258 or email barrian@actrix.gen.nz.

PACIFIC 2002 International Maritime Conference

Fresh from the success of their inaugural Sea Australia 2000 conference, the organisers are already planning the second, PACIFIC 2002 International Maritime Conference, to be held in conjunction with the PACIFIC 2002 Exhibition and the Sea Power Naval Conference. All will be held at Darling Harbour, NSW, from Tuesday 29 January to Friday 1 February 2002. The International Maritime Conference is being organised by the Royal Institution of Naval Architects, The Institute of Marine Engineers, and the Institution of Engineers, Australia, with a steering committee under the chairmanship of John Jeremy. Further details may be obtained from John on (02) 9326 1779 or email pacificimc@tourhosts.com.au.

PACIFIC 2002

HMAS *Arunta* keeping an eye on USS *Abraham Lincoln* during RIMPAC 2000 (RAN Photograph)

Launch of *Parramatta*

The fourth RAN ship to be named *Parramatta* was launched at Williamstown, Victoria, on 17 June.

The seventh Anzac class frigate to be built by Tenix Defence Systems, *Parramatta* was named by Mrs Jill Green, the daughter of LEUT George Langford RAN who was killed when the second *Parramatta* was sunk in 1941.

The first *Parramatta* was a 700 ton torpedo boat destroyer built in Scotland in 1910, the second a Grimsby class sloop built at Cockatoo Dockyard and completed in 1940, and the third a Type 12 frigate, also built at Cockatoo and completed in 1961.

Milenium from Incat Tasmania

The latest wave-piercing catamaran from Incat has been delivered to Trasmediterranea S A for operation in the Mediterranean. Launched on 15 April 2000 from Incat Tasmania's Coverdales shipbuilding facility at Hobart's Prince of Wales Bay, the 96 metre *Milenium* entered service in Spain at the end of May.

Passenger Facilities

The interior decor uses bright tones of blue, burgundy and yellow. Featuring large expanses of wood-grain panelling and 'Stratica' flooring, with striking inlaid motifs, the interior provides the traveller with a modern, elegant nautical environment, and the operator with a functional and easily-serviced space. The passenger area is capable of carrying up to 900 persons.

Passengers enter amidships, through large side-entry doors, to the central lounge, which features tub style seats in clusters of four, around circular tables. The central lounge is the focal point of many activities on board the vessel. Providing additional rows of recliner-style seating on both sides, the most striking feature of the central lounge is a skylight with fluorescent lighting around its base and a sky-coloured ceiling surround. The extensive use of stainless steel handrails, gold metallic paints and a variety of plants give the interior a luxury appearance.

At the forward end of the spacious lounge is a large centrally-positioned shop. Aft of the shop is the forward-facing central café, where passengers can purchase hot and cold foods and a wide variety of refreshments. Aft of the central kiosk are port and starboard seating areas with lounge-style seating and tables separated by the central amenities block, containing male and female toilets and a unisex toilet for disabled passengers. Stairways on each side of vessel, featuring overhead skylight windows, provide access to the vehicle deck on Tier 1.

The forward lounge features pairs of recliner-style seats surrounded by a sweeping expanse of tinted windows, offering passengers spectacular views over the ship's bow. Central to the area is another café/bar, selling beer and spirits as well as a wide variety of hot and cold foods. Immediately behind the café/bar are male and female toilets and additional lounges port and starboard with rows of recliner-style seating. Stairways on each side provide access to the forward vehicle decks.

The most impressive feature of the aft first-class lounge is the floor-to-ceiling windows facing onto an external aft deck where passengers can view the operation of the waterjets from above. Seating in the lounge is a combination of tub chairs and tables in the centre, and pairs of first-class recliner-style seats positioned outboard on each side. Situated in the centre, forward of the aft first-class lounge, is another café/bar, where passengers can purchase beer, wine and spirits as well as hot and cold foods, or just sit at a row of bar stools and enjoy the view. Immediately forward of the café/bar are the first-class toilet facilities. External stairways on each side provide first-class passengers private access to the vehicle deck aft.

The use of flexible mounts between the hull and superstructure ensures that a minimum of noise and vibration permeates the passenger cabin. All

interior materials, including seats, carpet and wall coverings, comply with the most stringent International Maritime Organisation (IMO) standards for fire, smoke and toxicity.

Fast Freight

The ship's vehicle decks offer a total of 330 truck lane-metres at 3.1 m wide by 4.3 m clear height, suitable for heavy road transport vehicles, and 370 car lane-metres at 2.3 m wide by 2.1 m high. The operator has the flexibility to carry 260 cars and no heavy vehicles, or 12 road freight trailers with 180 cars, or 24 road freight trailers with 85 cars. The provision of nine hoistable mezzanine vehicle decks allows the ship to offer the necessary lane-metres required for maximum car loading as well as offering the headroom demanded by oversize freight vehicles.

Control Station

The raised control station onboard *Milenium* may seem small for a vessel of its size. The large bridge windows provide 360-degree visibility for the officers. An aft-facing docking console and TV monitors negate the need for bridge wings with their associated structural weight and windage. As with all recent Incat vessels, the control station is fitted with the latest in electronic, navigation and communication equipment to comply with the requirements of the High Speed Craft Code Sea for Area A2.

Powerplant

Milenium is powered by four Ruston 20RK270 marine diesel engines developing in excess of 28 000 kW. The 20-cylinder engines drive transom-mounted steerable Lips 150D waterjets via Reintjes VLJ6831 gearboxes. All four waterjets are configured for steering and reversing, while an independent hydraulic system in each hull covers the steering and reverse functions.

Ride Control

Incat, in collaboration with Maritime Dynamics Inc., has developed a fully-integrated ride control system. The ride control system, fitted for the first time to *Milenium*, consists of transom-mounted trim tabs and a new retractable T-Foil located at the aft end of the centre bow. The new T-Foil will retract out of the water behind the centre bow when not in use. When lowered it will perform all of the same functions as the previous T-Foils, while improving the maintenance and operational factors. Each active control surface responds independently to a computer, which receives information from strategically-placed motion sensors. With the ability to almost anticipate the vessel's next move, the system dramatically reduces, pitch, roll and heave, the major contributors to motion discomfort.

Lifesaving Equipment

Milenium is fitted with six evacuation stations; two on each side of the vessel contain an IMO-approved marine evacuation system (MES) supplied by Liferaft Systems Australia. An additional liferaft access station is located on each aft mooring deck. An MES consists of an inflatable slide, which connects with multiple 100-person liferafts. The evacuation arrangement has proved capable of evacuating the full vessel's passenger complement in much less time than the IMO requirements. In addition the vessel was designed and built with high levels of reserve buoyancy, fire detection/protection and systems redundancy.

Fire Protection

The lightweight structural fire protection systems aboard *Milenium*, including fire doors and dampers, are supplied by Hobart company Colbeck & Gunton. The Rapid Access (deckhead) and Lightweight (bulkhead) fire protection systems are the results of a development process that began ten years ago with Incat's first wave-piercer. Just as the ships have developed, so too has the fire protection system, meeting the demands for lighter weight and faster installation. *Milenium*, as with all Incat craft, has an addressable fire detection system, closed-circuit TV cameras, and zoned fire sprinkler systems and hydrants protecting engine rooms, vehicle decks and the passenger areas. The ship is also fitted with portable fire extinguishers, fire-protection suits and equipment, water fog applicators, breathing apparatus, international connections and fire control plans to meet IMO requirements.

General Particulars of *Milenium*

Certification	DNV ✠1A1 HSLC R1 Car Ferry “B” EO Certificate
Length Overall	96 m
Length Waterline	86 m
Beam Overall	26 m (excluding fenders)
Draft	4 m max.
Hull Beam	4.5 m
Deadweight	710.04 t
Trial Speeds (at MCR)	48 knots lightship 42 knots at 535 dwt
Total Persons	up to 900 people
Vehicle Deck Capacity	330 truck lane metres at 3.1 m wide x 4.3 m clear height
Car Capacity	additional to above of 85 cars at 4.5 m length x 2.3 m wide
Full Car Capacity	260 cars (no trucks)
Main Engines	Four Ruston 20RK270 marine diesels of 7 080 kW @ 1030 RPM
Transmission	Four Reintjes VLJ6831 Gearboxes
Water Jets	Four LJ150 D waterjets configured for steering and reverse
Alternators	Four Caterpillar 3406B 230 kW alternators supplying 415 V, 50 Hz

Milenium on trials off the Tasmanian coast.
(Photo courtesy Incat Tasmania)

INCAT launches largest-ever ship

The largest ship ever built in Tasmania quietly slipped into the water on Saturday 29 July 2000. The 98 metre *Incat Tasmania* is also the biggest aluminium ship to be built in Australia and is capable of carrying 900 passengers and 260 motor vehicles, and can travel at over 40 knots. After delivering the Olympic torch from Kingston Beach, Tasmania to Port Arthur on 3 August, *Incat Tasmania* returned to Prince of Wales Bay to complete the internal fitting out and to make the ship ready for the Sydney Olympics. *Incat Tasmania* will be on charter to AusTrade for the duration of the Olympics and will be moored in Darling Harbour for exclusive use of Business Club Australia members.

[A ship visit has been arranged for members; see *Coming Events* — Ed.]

Incat's largest ship during trials. The ramp on the starboard quarter is a temporary structure for access in Darling Harbour during the Olympics (Photo courtesy Incat Tasmania)

Defence re-organisation

On 26 June the Chief of the Defence Force, Admiral Chris Barrie, and the Secretary, Dr Allan Hawke, announced changes to the organisation of Australia's Defence structure.

The new arrangements took effect from 1 July 2000 and will be embedded by 1 October 2000 after a three-month transition period.

These changes will support the development and implementation of two parallel activities underway in Defence for the remainder of this calendar year. These are the development of a statement of Government's preferred Defence Strategy, in the form of a White Paper, and the development of a Defence business strategy. The latter will take the form of a balanced scorecard — to be known as Defence Matters — that will link high-level goals to the work of individuals throughout the organisation.

These activities will converge to enable the publication (by early next year) of a Defence Corporate Plan, incorporating both external and internal objectives.

The New Defence Organisation Structure

The new Defence organisation structure will reflect the three quite different sets of roles and responsibilities that need to interact to deliver results to Government. Included in the structure

are some important new appointments.

Five executives (the Chief of Navy, Chief of Army, Chief of Air Force, Commander Australian Theatre and Deputy Secretary Strategy) are responsible for delivering products directly for the Government. These outputs are Navy Capabilities, Army Capabilities, Air Force Capabilities, Operations, and Policy Advice.

A series of enabling executives (the Under Secretary Materiel, the Chairman of the Defence Intelligence Board, the Chief Defence Scientist and the Deputy Secretary Corporate Services) work to support the delivery of these products.

A third set of executives work in direct support of good governance, and are focussed on the role of Government as Defence's 'owner'. These are: Vice-chief of the Defence Force, Chief Finance Officer (new position), Head of the Defence Personnel Executive, Chief Knowledge Officer (new position), Head of Public Affairs and Corporate Communication, and the Inspector General.

There are some associated staffing changes. After nearly five years in the job, Mr Hugh White will leave the Deputy Secretary Strategy position to work full-time overseeing the Public Discussion Paper and White Paper processes.

Dr Richard Brabin-Smith will transfer to the Deputy Secretary Strategy position. Dr Roger Lough will act as Chief Defence Scientist, Mr Greg Harper will act as Chief Finance Officer and Mr Rod Corey will act as Deputy Secretary Corporate Services, pending permanent filling of the position.

The Under Secretary, Mr Mick Roche, will head a new Defence Materiel Organisation, formed from merging the Defence Acquisition Organisation, Support Command Australia and the National Support Organisation. The new organisation will have its headquarters in Canberra, with its functions decentralised and dispersed across Australia. Mr Roche (supported by Major General Peter Haddad as Commander Support Australia, and Major General Peter Dunn as Change Manager) will oversee major reforms to improve the timeliness, cost performance and quality of Defence's major capital acquisitions and their through-life management.

The New Defence Committee Structure

There will be five key committees. Principal among these will be the Minister's Defence Improvement Committee. This will be chaired by the Minister and will include the Secretary, the Chief of the Defence Force, and two external directors appointed by the Minister. This committee will meet quarterly, or as required by the Minister. It will agree on and oversee the implementation of a program of continuous improvement within Defence to ensure that the Government is receiving value for the money expended on Defence.

The Defence Committee will be chaired by the Secretary. It will include the Chief of the Defence Force and Defence's most senior military and civilian officers. This Committee will have an explicit advisory role to the Secretary and Chief of the Defence Force, who are the executive decision makers.

The role and membership of the Chiefs of Staff Committee will remain unchanged. This committee is chaired by the Chief of the Defence Force, with the Secretary as a permanently-invited member. It provides military advice to the Chief of the Defence Force to assist him in discharging his command responsibilities and providing military advice to Government.

The Defence Capability and Investment Committee will be chaired by the Vice-chief of the Defence Force and is charged with ensuring that Government is provided with sound options for major capital investments. The Minister will be seeking sign-off by each member of the Committee that, as far as his or her area of responsibility is concerned, the options put to Government are sound and achievable.

A more tightly-focussed Defence Audit Committee will incorporate two external independent members. One of them — Mr Paul McGrath, formerly Chief Executive Officer of the Australian Maritime Safety Authority — will be its chair.

Defence Review 2000

On 27 June 2000 the Prime Minister and the Minister for Defence announced the most extensive public consultation process ever undertaken on defence and security issues with the release of the *Defence Review 2000: Our Future Defence Force — A Public Discussion Paper*.

The Government is conducting a fundamental review of defence policy and is keen to ensure that the forthcoming White Paper takes into account the views of the Australian people. As part of this process, the Public Discussion Paper has been designed to promote consideration of the key issues relating to Australia's defence requirements and how these requirements can be met. It enables the people of Australia to have an input into, and better understanding of, the defence issues that the Government must consider in preparing the White Paper.

The Government has appointed a Community Consultation Team comprising the Hon. Andrew Peacock, Dr David MacGibbon, Mr Stephen Loosley and MAJGEN Adrian Clunies-Ross (Retd) The team is intended to facilitate public feedback and discussion, to identify and consolidate key elements of the community response to the Discussion Paper, and will report its findings to the Government. The Consultation Team has been travelling extensively around capital cities and regional centres, consulting with a wide range of interest groups and individuals.

The Government has encouraged individuals and groups to make their views on the issues raised in the Public Discussion Paper known to the Community Consultative Team by forwarding written submissions, using the feedback facility on the Discussion Paper website, or attending the open sessions being conducted around Australia by the consultation team. The RINA Australian Division Council will make a written submission to the Community Consultative Team.

Copies of the discussion paper can be down-loaded from the White Paper web-site (www.whitepaper.defence.gov.au) or requested from the Defence Review 2000 Secretariat by phone, free call 1800 444 034 or email whitepaper@cbr.defence.gov.au.

Big Order for WaveMaster

On 14 July WaveMaster International announced an order for ten 36 m high-speed aluminium monohull ferries for delivery to Singapore. Financing for the order has been arranged through Singapore-based Caterpillar Credit Services Asia Pte Ltd, a wholly-owned subsidiary of Caterpillar Financial Services Corporation of Nashville, Tennessee.

Firm contracts have been signed for the initial six-vessel order, and the shipyard and purchaser have signed options for the remaining four vessels. All ferries will be designed and constructed in Western Australia at WaveMaster's Henderson facilities.

Design of the new monohull has been developed in compliance with the stringent safety requirements of the IMO High Speed Craft Code and the Singapore Marine Authorities.

The combination of low capital cost, simple maintenance, and safe, passenger-pleasing accommodation, also draws from experience gained from the numerous earlier WaveMaster monohulls, all of which continue to operate profitably on some of the world's most competitive routes.

The first six vessels are expected to be delivered in nine months. Hulls and superstructures will be built in separate halls to accelerate construction, although the real key to speed of production is WaveMaster's three-dimensional Unigraphics design solution. Unigraphics, used extensively in the production of motor vehicles and aircraft by companies such as General Motors and Boeing, produces a solid model of the entire vessel, and allows customers to realistically assess WaveMaster's design. This ensures that everyone fully understands the design before building.

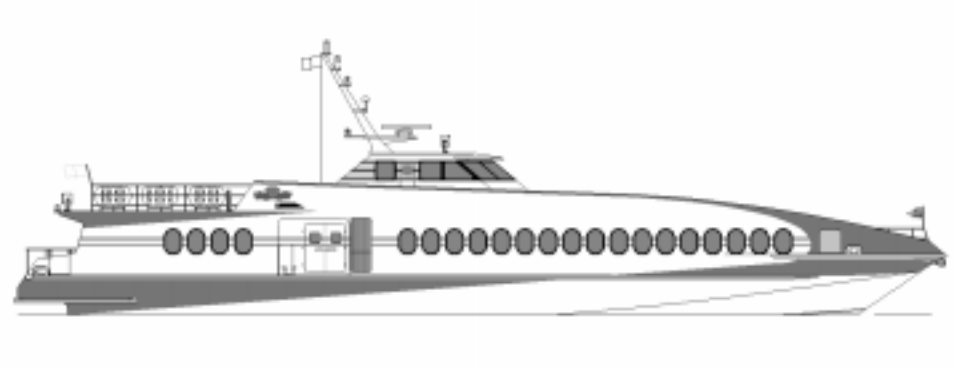
Delivery of this modern ten-vessel fleet, early next year, is expected to revolutionize fast ferry travel between Singapore and Indonesia's Riau Islands. There are no alternatives (road or air) to ferry travel on this route.

Over three million passengers per annum take the ferry to Indonesia, and this market is grow-

ing rapidly. This growth is due to the islands' popularity for inexpensive holidays, as well as rising levels of investment by Singaporean and Indonesian interests.

Since 1984 WaveMaster has delivered seventeen fast monohulls to operators in Malaysia, Indonesia, the Philippines and Singapore.

The order also follows WaveMaster's recent European deliveries — the 37 m monohull *Draíocht na Farriage* to Ireland and the 50 m monohull *Speedy* to Germany.



WaveMaster's 36 m monohull ferry for Singapore (above)

The 50 m monohull *Speedy*, built by WaveMaster for Germany (above)
and the 37 m monohull delivered recently to Ireland (below)

Collins Class Submarines on Road to Recovery

The program to fix the Collins class submarines was on track, one year after the McIntosh Prescott Report, the head of the Submarine Capability Team, RADM Peter Briggs said on 3 August.

RADM Briggs confirmed that the two "fast-track" submarines, *Dechaineux* and *Sheean*, when upgraded by December, would be able to operate against a number of potential adversaries. In the meantime, he said that two of the three operating submarines, HMAS *Collins* and HMAS *Waller*, were participating successfully in exercises with the US Navy off the coast of Hawaii.

RADM Briggs said Defence was overcoming the Collins class submarine's operational deficiencies and improving their reliability. 'The problems are being fixed and we have significant improvements to noise signature on the upgraded submarines — *Collins*, *Dechaineux* and *Sheean*.'

RADM Briggs reported that HMAS *Collins* successfully conducted a Harpoon long-range anti-ship missile firing, achieving test objectives, when exercising last week. 'The harpoon firing by *Collins* is a significant final test that the weapon has been correctly integrated with the submarine's systems, however, it does not represent a demonstration that the combat system itself is satisfactory. In the longer term I believe it will be necessary to replace the combat system on all six submarines, which will be the biggest additional expense for the project,' RADM Briggs said.

He added 'The problem with the current combat system is that its operation is cumbersome, the presentation of the information is poor and the response time from entered data is too slow. I believe the total upgrade for all six submarines to bring them to full operational capability, including a replacement combat system, will cost approximately $1 billion. The current upgrade being performed on the two "fast-track" submarines is costing $266 million which is included in this additional amount. Half of this $266 million is being used to incorporate new technology to enhance the operational performance of the two submarines. The balance of the funding is being used to rectify their shortcomings, such as reshaping the hull and the fitting of a new propeller to achieve noise reduction.'

He said the new equipment being installed in the two "fast-track" submarines provided interim solutions to improve the current combat system operations. 'We have proposals for a replacement combat system and have short-listed two companies' submissions which are being evaluated now. Up until December 1999 there had been no real cost increase or additional funds provided to the original $5.1 billion expenditure for the project (March 2000 prices).'

Government to Acquire Shares in the Australian Submarine Corporation

The Federal Government announced on 26 June that it would acquire the remaining shares in the Australian Submarine Corporation (ASC), subject to achieving a satisfactory outcome on price. The Government's intention is that the company be restructured to implement more sustainable arrangements for the future support of the Collins class submarines and to facilitate its later sale.

The decision follows the review of options for the future ownership of ASC by the Department of Defence, and the Office of Asset Sales and IT Outsourcing (OASITO), assisted by the firms N. M. Rothschild (Australia) Limited, and Blake Dawson Waldron.

The Government said that the decision to acquire the remaining shares in ASC reflects the importance the Government attaches to ensuring the best possible arrangements for bringing the Collins class submarines to a fully-operational state, and supporting them throughout their operational life. Further, the Government is keen to pursue the benefits of full private ownership of ASC. It recognises the considerable skills base that has been established at ASC and the company's importance to South Australia.

ASC is expected to have a close, ongoing relationship with the Design Authority for the submarines, Kockums AB, and its new parent, Howaldtswerke-Deutsche Werft AG, whose co-operation and support have been welcomed by the Australian Government.

Naval Air Warfare Capability Decision

The Minister for Defence, John Moore, announced on 24 May that the Defence Capability Committee has formally decided that the US Navy Kidd class destroyers will not be acquired by the Australian Defence Force. The DCC reached its decision on the basis that, in the present environment, they do not provide longer-term value for money.

'The Kidds were only one option for Navy's long term air warfare capability and they were closely examined,' Mr Moore said. 'Although they will not be acquired, the examination of the Kidd option proved a useful exercise in exploring issues relevant to the acquisition of an effective air warfare capability for the ADF's surface fleet.'

Mr Moore said that a decision on a naval air warfare capability would be made following the Defence White Paper, due for release later this year.

A joint Defence and industry team has been established to determine the most effective way to acquire the capability for the ADF. 'The Government recognises that an air warfare capability in the surface fleet is an important consideration. It also is an expensive one,' Mr Moore said. 'The Federal Government and the Defence Department will continue to work with industry to investigate the question of the future of Australia's surface fleet, including air warfare capable ships.'

'This will include consideration of industry's future ability to support the ADF in the provision of its maritime capabilities,' Mr Moore said.

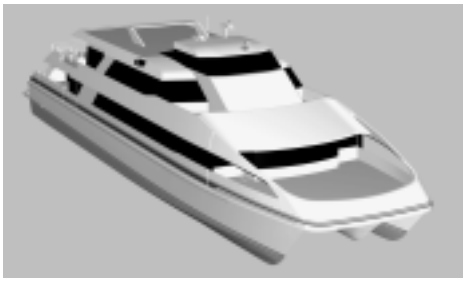
News from New South Wales

New Construction

Incat Designs licensee Gladding Hearn delivered their fourth vessel, *Salacia*, to Boston Harbor Cruises in June. *Salacia* is currently the largest fast ferry built in the USA and has the capacity to carry 600 passengers at a service speed of 35 kn. She will be operated on Boston Harbor after her initial charter, which was following a fleet of tall ships up the east coast of the USA.

Salacia on sea trials near Gladding Hearn's Massachusetts shipyard
(Photo courtesy Incat Designs)

Incat Designs have now released some details of the new catamaran being built by Nichols Bros. Boat Builders for Catalina Express. The vessel will be 44 m in length by 10.25 m beam and will be powered by four Cummins KTA50s driving Hamilton waterjets. Carrying 390 passengers and their baggage, the vessel will have a service speed of 36 knots.



Rendering of the 44 m catamaran currently under construction at Nichols Bros. Boat Builders
(Image courtesy Incat Designs)

The first of Sydney's new SuperCats for the State Transit Authority fleet was launched at Garden Island on Sunday 6 August. The vessel was lifted into the water by crane in a seamless, well-controlled operation, with minimal disruption to week-day production. The vessel will spend the next few weeks alongside, completing outfit and trials. The vessel is expected to be christened at a naming ceremony on 5 September, and to begin operations on Sydney Harbour on 11 September. The vessels are to a design by Graham Parker, who also designed Sydney's Rivercats and Brisbane's CityCats. The aluminium hulls are being built by Transfield at Seven Hills, and towed down river to Garden Island. The FRP superstructures are being built by Bass Boats at Garden Island. Project management is by ADI Projects. The superstructure for the second vessel was mated with the hulls on Thursday 10 August, and the hull of the third vessel arrived at Garden Island on Wednesday 16 August. *The ANA* expects to publish a comprehensive article on these vessels in November.

The first three of seven new 16 m boats, built by Image Marine in WA, for the NSW Police arrived in Sydney on 25 June. The next two 16 m vessels plus the first of two 20 m vessels left WA on 6 July, were seen refuelling in Eden, and arrived in Sydney on 15 July. David Lugg, the designer, was part of the delivery crew on this second group of vessels. The remaining vessels arrived in Sydney on 30 July.

New Design

Incat Designs have recently contracted a further two new designs in the USA. The first of these is a fifth vessel for Boston Harbor Cruises that will be operating on a yet-to-be-disclosed route outside Massachusetts. This vessel will be very similar to the Millenium-class vessels, of which they already have three, and will be capable of carrying 350 passengers at 35 knots. The vessel is scheduled for delivery in June 2001.

The second vessel is 35 m in length and will have the capacity to carry 315 passengers at 26 kn in operation on San Francisco Bay. The vessel is scheduled for delivery in July/August 2001.

Around and About

An inclining experiment was conducted on *James Craig* on 21 June, supervised by Jan Faustmann. The start time was advanced to 0600, successfully avoiding windage problems which occasioned postponement of the inclining on *Batavia* a month earlier. The main engines were run for the first time on 7 July and, when settled, the propellers were turned forward and astern at slightly above idle. On 19 July she moved under her own power for the first time in 75 years, albeit under iron in lieu of cotton topsails. Harbour trials were conducted, and she manoeuvred easily (more easily than expected under power in view of her small rudder), and she achieved 10.8 kn at the MCR of the main engines.

James Craig underway under her own power
(Photo Sydney Heritage Fleet)

After swinging the compass on 26 July, Captain Ken Edwards "put his right hand down a bit", and her bows curtsied to the lift of ocean swells for the first time since she arrived in Sydney under tow on Australia Day, 1981. Sails were hoisted at sea on 12 August, and you can now expect to see her under sail regularly.

Bureau Veritas has a new set of Rules for the Classification of Ships due for release in September. Len Michaels, the Marine Manager for Australia and New Zealand, has run a training course for their surveyors to ensure that all are up to speed on the new rules.

Incat Designs held an open day for secondary and tertiary education students on 12 July, attended by three high-school students, nine from Sydney Institute of Technology and two from UNSW. The students were given an introductory presentation to the company, followed by a tour of the office and discussion with each of the staff on what they were working on and how they were doing it. Feedback from the students has been excellent.

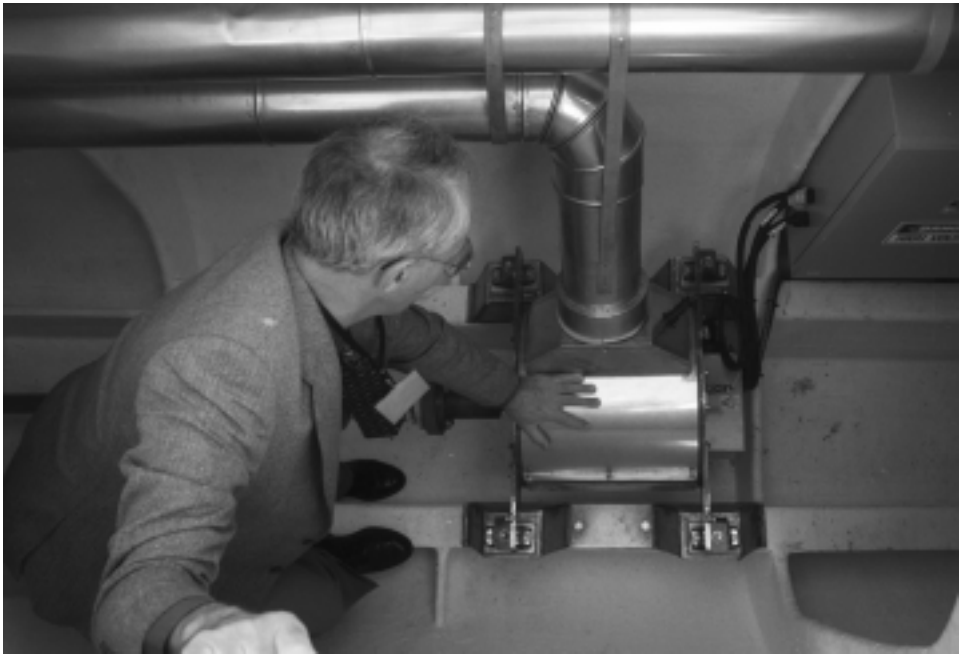
Phil Helmore

Solar Sailor in Sydney

Sunday 25 June was appropriately sunny for the reception for the *Solar Sailor* at the Australian National Maritime Museum in Darling Harbour. Described as the world's largest solar-powered vessel, the *Solar Sailor* is powered by the sun and wind using a unique Australian-developed solar wing technology. The catamaran, designed by Graham Parker, can carry 100 passengers and two crew and commenced commercial operation in July, managed by Captain Cook Cruises. The novel and advanced vessel is expected to attract considerable attention during the Olympic Games.

The 21.5 m catamaran is powered by two 40 kW rare-earth magnet brushless DC motors. Power is supplied by solar panels backed up by two tons of batteries in the hulls and an 80 kW LPG generator for emergencies. Speed under solar power alone is 7 kn in full sun or 3-4 kn in overcast conditions. Using both the solar panels and the wings a speed of 12 to 15 kn is expected when reaching in 15 kn of wind.

Solar Sailor passing by *James Craig* during a demonstration cruise on Sunday 25 June (Photograph John Jeremy)



The 40 kW rare-earth magnet electric motor in the port hull of *Solar Sailor*. Most of the bulk of the motor is air ducting for cooling (Photograph John Jeremy)

The new dredge

NQEA Australia Launches Dredge

Cairns shipbuilder and engineer NQEA Australia has launched a dredge having a launching displacement in excess of 1500 t. The 85 m dredge, which will have a lightship of about 2500 t when completed in November, is being built for the Port of Brisbane Corporation.

The launch was the largest ever carried out by NQEA, who had to devise a new launch method because of the size of the hull to be passed down the slipway. 'The technique we devised, using hydraulic bogies to support the moving hull, allowed us to maximise the size of vessel that could be launched,' said NQEA Australia's Executive Director, Mark Fry.

The type of hydraulic cylinders used in the launch were the Enerpac RC-1006. The 933 kN cylinders are typically used for testing and lifting operations in construction, fabrication, maintenance and mining tasks. In the dredge launch, eight cylinders were used under water. The cylinders, with a 160 mm stroke and a spring return, were powered by a hush pump with a 1.1 kW motor. Enerpac National Technical Manager, John Maudson, said the common-circuited stage of the cylinders supported the weight of the hull evenly and allowed them to find their own balance.

Engineers Australia, July 2000

Wave Wake Measurement and Prediction

Gregor Macfarlane

The topic of wave wake, that is, waves generated by the forward motion of marine vessels, is of great interest to vessel designers, builders, operators, government departments and environmentalists. It is becoming of even more importance with the increased use of high-speed craft on sheltered waterways due to the problems associated with bank erosion and the dangers to other users of the waterway. Subsequently, in order for a vessel to be accepted it has become commonplace for designers, builders and operators to show that their vessel will meet set criteria, or display "low-wash characteristics".

Over the past ten years the AMC's Ship Hydrodynamics Centre has developed model scale measurement techniques for use within its 60 m long towing tank and the 25 m indoor pool within the AMC Survival Centre. The tests within the Survival Centre have allowed wave wake measurements to be obtained at large distances from the track of the vessel and to eliminate the uncertainty due to the presence of solid (tank) boundaries.

Both facilities have been extensively used to conduct a comprehensive series of ship model experiments in order to complete the following tasks:

- develop documented procedures for the conduct of both model and full-scale wave wake measurements to ensure accuracy and repeatability;
- determine the limitations of the relatively narrow towing tank and thus develop prediction techniques to improve its usefulness;
- develop a method by which the major characteristics of the waves generated can be measured and presented in a way that best represents the problems that these waves cause, and can be used to directly and fairly to compare one vessel against another vessel; and
- develop a database of experimental wave wake measurements for a variety of hull forms to provide a useful tool for designers and researchers alike for the development of hull forms that display low-wash characteristics. This database presently includes over 80 hull form conditions, from which plots can readily be produced. Some of the activities that this database has been used to assist the Australian ship building industry to date include:
  - ✓ determination of achievable and rational criteria for specific locations for a proposed vessel and vessel speed;
  - ✓ making direct and fair comparisons between competing designs or against specific limits;
  - ✓ assisting in determining whether a multihull is preferable to a monohull for a specific purpose;
  - ✓ investigation of the effect that a particular design variable, such as waterline length or displacement, has on the waves generated; and
  - ✓ determination as to whether a vessel can truly be described as displaying low-wash characteristics or not.

The experimental program has also been expanded to include the conduct of full-scale experiments on a number of existing vessels. This has resulted in the development of correction/scaling techniques to enable accurate predictions of wave wake properties to be made from model experiments. In addition, a preliminary investigation into the effect that finite water depths (shallow waters) have on wave wake properties has been undertaken in the past six months. This has involved a series of physical model tests in AMC's towing tank and a series of numerical predictions using the computational fluid dynamics software package, *Shipflow*. Considerable further work is planned in this field, particularly following the development of AMC's model test basin which is due for completion late this year. The basin will have the dimensions of 35 m long x 12 m wide and have a variable water depth between 0 – 1 m, ideal for investigating the waves generated by vessels operating at critical and super-critical speeds.

EDUCATION NEWS

Curtin University

Curtin University is once more running the short course *Design for Small Craft*, two hours a week for 14 evenings from July to November. The course introduces basic naval architecture concepts to those with no formal technical background in the field. It will be taught by industry practioner Ken McAlpine. This is the 15th year that Curtin has been running their naval architecture short course series.

Kim Klaka

The University of New South Wales

Undergraduate News

Our 2000 graduates are now employed as follows:

Michael Andrewartha	PhD at UNSW
Bill Boddy	Consulting
Lina Diaz	Bureau Veritas, Sydney
Shinsuke Matsubara	PhD at UNSW
Kev Nonsopa	ADI Marine, Garden Island
Simon Robards	PhD at UNSW
Chris Tucker	Austal Ships
Delwyn Wee	Republic of Singapore Navy

Sydney Heritage Fleet was once more our generous host with the provision of their steam yacht *Lady Hopetoun* for the third- and fourth-year students to conduct an inclining experiment at Rozelle Bay on 17 May. The students conducted the experiment with the guidance of lecturer Mr Phil Helmore. The day was perfect for an inclining, and the students made a great fist of their first inclining. The theory of stability is interesting in its own right, but seeing it in practice at an inclining brings it *alive* for the students.

The Principal Representative Maritime and Ground Systems (Victoria) was once more a generous host to our final-year students, accompanied by lecturer Mr Phil Helmore, for them to see the launching of the seventh Anzac-class frigate, HMAS *Parramatta*, at Tenix Defence Systems' construction facility at Williamstown. On Friday, 16 June, the day before the launching, Mr Peter Goodin welcomed the students to the yard and gave a presentation on the launching drawings, arrangements and calculations. Mr Bob Hammer then led a tour of the ways where prepa-

rations for launching were in progress. After lunch, Mr Ferdie Lopez led a tour of the Tenix construction facility with vessels in various stages of completion, from cutting plate for Anzac 09 through to Anzac 06 fitting out alongside. The launching of HMAS *Parramatta*, on Saturday 17 June was textbook-smooth (apart from the ceremony getting ahead of unlocking the triggers), and a credit to all concerned.

The Australian Maritime College once again acted as host to A/Prof. Lawry Doctors and his third-year naval architecture students studying ship hydrodynamics. The visit took place on August 7 and 8, and the students used the towing tank for conducting calm-water resistance tests on a planing hull and for regular-wave ship-motion tests on a container ship hull. They will subsequently compare the experimental data with theoretical techniques. The students were also shown the other experimental equipment at the College during their visit, including the cavitation tunnel, the flume tank and the ship simulator.

By way of thanks, A/Prof. Doctors gave a presentation to the AMC on *The Influence of Hull Configuration on the Motions of Catamarans*, on the afternoon of the first day of the visit to Launceston.

As part of the re-structuring of the naval architecture degree course, Craig Boulton, of Advanced Multihull Design, lectured to the final-year students on the design of high-speed craft in Session 1. David Lyons, of David Lyons Yacht Design, is now lecturing to the final year students on the design of yachts in Session 2. The course on yacht design was advertised in the Newcastle–Sydney–Wollongong region and, as a result, four external students are also availing themselves of this presentation by a practising naval architect.

Post-graduate and Other News

All the current postgraduate students involved in naval architecture or maritime engineering research made their review presentations at the annual seminar in June, and all successfully passed.

Ian Raymond presented his paper *Optimisation procedure for X-80 steel blast-tolerant transverse bulkheads* at the Structures Under Shock and Impact 2000 (SUSI2000) International Conference, held from 3 to 5 July at New Hall, Cambridge University, UK. This was the seventh SUSI conference and, as at previous conferences, participants included many of the top impact and blast researchers from around the world.

Professor Shigeru Naito from the Department of Naval Architecture and Ocean Engineering at Osaka University, Osaka, Japan, made a presentation on *Ship Propulsion Factors and Research at Osaka University* at a seminar on 10 May attended by twenty-seven students, staff, and visitors from the greater Sydney area. He was visiting Australia on an exchange visit supported by the Japan Society for the Promotion of Science (JSPS) and, during this visit, he spent time both at the Australian Maritime College and UNSW. Another of his purposes was to promote cooperation between the Australian Division of RINA and the Japan Society of Naval Architects.

During his talk, Professor Naito touched on a number of topics, including an oval omni-directional wave tank in operation at Osaka University. His main emphasis, however, was the matter of added resistance of ships in waves and the associated involuntary speed loss. He presented a number of interesting graphs comparing the added resistance in waves, as obtained from experiments, with calculations based on both linear and non-linear strip theories. Most of this work was directed at large steel vessels, such as bulk carriers and container ships, and the theory works well for fine vessels but not for those of full form.

Dr Alexander (Sandy) Day from the Department of Naval Architecture and Ocean Engineering at the University of Glasgow in Scotland visited the University of New South Wales from 7 July to 6 August. The purpose of the visit was to advance the study of resistance prediction of high-speed craft and the analysis of the associated wave-wake problem. This cooperative work with A/Prof. Lawry Doctors has been in place for some years now and, as a result, improved techniques for making theoretical predictions have now been developed.

Phil Helmore
Lawry Doctors

Vale AME CRC

Kim Klaka

The Australian Maritime Engineering CRC closed its doors on 30 June 2000 after 8 years of operation as Australia's main research organisation for naval architecture and maritime engineering. There is no entity taking its place.

AME started in July 1992 with Phil Hercus as Board Chair, the late Tom Fink as Executive Director, and four Associate Directors — Lawry Doctors from Sydney, Martin Renilson from Launceston, Jon Hinwood from Melbourne and Kim Klaka from Perth. There were 26 participating organisations, a roughly even mix of industry, government and academia. They contributed cash and in-kind (usually staff or ship time) of varying amounts, totalling over $6 million p.a. The aim was to provide training, research and technology transfer to solve industry problems. The target industries included offshore oil and gas, underwater systems, ship construction and ship operation. Naval architecture was a significant proportion of the centre's activities — perhaps 60%. However, shipbuilders were not strongly represented (mainly ASC and, for a while, Tenix/Transfield). The Centre was based at four main nodes or cores (Launceston, Melbourne, Perth and Sydney) giving it genuine national coverage albeit at considerable investment in Qantas and Ansett.

Six months after the Centre's inception, ED Tom Fink became ill and resigned. He was replaced by Martin Renilson who was injured in a plane crash one year later. Jon Hinwood then stood in (with some trepidation, given the trend!) prior to Don Lennard taking on the position in 1994. He retired in 1998 and Colin Chipperfield took over. He in turn resigned in 1999 and Mike Hook was appointed until the wind-up in June this year. Six Executive Directors in 8 years was challenging but surprisingly effective.

By comparison, the position of Board Chair was relatively stable, with Don Williams taking over from Phil Hercus in 1993. The submission for Federal funding renewal was made in 1999, focussing on defence and offshore oil and gas. It was unsuccessful, despite having unprecedented high levels of industry commitment.

What did AME CRC achieve? The list is too long for this brief note, but some of the naval architectural highlights include:

- Tank testing the second-largest standard series of yacht forms in the world, contributing to an industry participant winning the largest sailing yacht contract for Australia.
- A similar tank program for the high-speed displacement ship hulls.
- The development and installation of more than 20 ride control systems on high-speed ferries.
- The construction and enhancement of a suite of experimental facilities, including a cavitation tunnel, open-water test facility, wave flume and planar-motion mechanism.
- A range of short courses, over fifty postgraduate students and a steady flow of overseas experts and practitioners, all of which translated into better trained undergraduates, graduates and industry professionals.

As mentioned, these are just examples. What are we left with after AME? The facilities are available and extensively used, so there has been substantial import replacement on research dollars. Several research products have been commercialised and are now entering the market e.g. Seakeeper and Maxsurf software. We have a new generation of postgraduate-qualified professionals working in the industry. This is already generating a culture change, with many ship design and construction companies conducting research beyond the needs of the next ship contract. However, the gestation period from research to commercial product is long (often ten years or more) and expensive. Very few companies are willing and able to invest over such periods, so the government traditionally

picks up some of the tab. With the loss of AME CRC a major funding source has gone, leaving the much smaller and more competitive ARC funding grants as the main source of medium-term research funds. This is the same situation as pre-AME, except that there are now more trained researchers capable of submitting a worthy application.

The reasons for AME's closure, its successes and its failures, will be the subject of many alehouse discussions for years to come. However, it is clear to me, at least, that Australian naval architecture was the better for its existence and the worse for its demise. What of the future? I can only speak with confidence about the Perth team, and we are bouncing back, fighting. We expect to be making some exciting announcements in the next few months, so watch this space….

FROM THE CROW'S NEST

IMO Award to Ian Williams

Former Australian Maritime Safety Authority (AMSA) executive, Mr Ian Williams, has been awarded the International Maritime Prize for 1999. The award, in recognition of his contribution, commitment and dedication to the work of the International Maritime Organization (IMO) in enchancing safer shipping and cleaner seas, was announced at IMO in London on 14 June.

Mr Williams has represented Australia and AMSA at numerous Councils, Conferences, Committees and Sub-Committees since 1985. During this time he has actively contributed to the development of many IMO initiatives, including the development of the High Speed Craft Code.

His most significant achievement was the contribution he made to saving seafarers through improved safety measures for bulk carriers, through the Marine Safety Committee's Intersessional Correspondence Group on Safety of Bulk Carriers and the Working Group on Safety of Bulk Carriers.

He was a member of the Panel of Experts selected by IMO to examine passenger roll-on, roll-off (ro-ro) ferry safety. As a result of this work, Mr Williams was elected President of the 1995 International Conference which amended the SOLAS Convention and introduced new safety measures for ro-ro ferries.

His competence and expertise at IMO is recognised by many member States and the international shipping community, and Australia is honoured that IMO has awarded him the 1999 International Maritime Prize.

AMSA Media Release, 15 June 2000

Small Craft Group Medal to Julian Bethwaite

At the 2000 AGM, the RINA President announced the award of the 1999 Small Craft Group Medal to Julian Bethwaite for his achievements in racing dinghy design which have revolutionised the performance of 14 ft international and other dinghies.

Two years ago, the International Sailing Federation (ISAF), formerly the International Yacht Racing Union, declared the need for a new twin-trapeze high-performance dinghy to replace the aging *Flying Dutchman* at the Olympic Games. The new dinghy class was required to be visually exciting when racing and not just exciting to sail, as had been the accepted norm.

Julian Bethwaite designed and developed the *49er* which, in the selection trials, proved not only faster but more spectacular in use than its competitors. It was quickly granted international status and accepted as the new Olympic two-handed centreboard class. Since then he has produced the successful smaller *29er* as an inexpensive junior trainer with a performance comparable to the *49er*.

RINA Affairs

Julian presented *Design and Construction of the Olympic Skiff Class* 49er to a joint meeting of the RINA (NSW Section)/IMarE (Sydney Branch) on 14 July in Sydney.

Classification Society Rules for Naval Surface Craft

Lloyd's Register of Shipping, Det Norske Veritas and the American Bureau of Shipping have all recently announced the release of rules for the

construction and classification of naval surface craft. For details, contact your friendly local survey office.

New Prop-driven WWSR…

At approximately 10:30 am Pacific daylight time on Friday 16 June, Russ Wicks (www.russwicks.com) drove the unlimited hydroplane U-25 *Miss Freei* to a new propeller-driven world water speed record on Lake Washington, Seattle, U.S.A. Runs northbound of 207.254 mph (333.543 km/h, 180.099 kn) and southbound 203.735 mph (327.880 km/h, 177.041 kn) over a measured mile gave a new WWSR of 205.494 mph (330.711 km/h, 178.569 kn), officiated by the American Power Boat Association (APBA) for submission to the Union Internationale Motonautique (Union of International Motorboating, the peak body which documents the world water speed record).

The hydroplane was modified slightly from APBA/UHRA rules for the record attempt: no RPM restriction, no fuel flow restriction (estimated at 4.8 gal(US)/min for this record attempt!), and smaller propeller and skid fin. Power was by a gas turbine engine, of course.

The previous record was 200.419 mph, set by Roy Duby in *Miss US I* in 1962. Since Roy's prop-driven record (in comparison to the outright record), it is a case of "a couple of men tried, none died."

Associated websites for afficionados include www.superior-racing.com, www.hydrofest.com/news.htm and www.hydros.org.

… and the Outright WWSR

Ken Warby's new jet-powered boat is complete and was on display at the Madison, Indiana, unlimited hydroplane race a few weeks ago. Some of the crew of the unlimited hydroplane *Miss Madison* have offered to help with the test runs of the boat in the next few weeks. Ken is appreciative of the support, and will probably do the test runs at Madison as they have a lot of expertise and support equipment there. He is negotiating with a shipping company to obtain the freight to Australia and back (for the record runs late next year) as sponsorship. He will be taking the boat to Clayton, New York (state), for the Classic and Wooden Boat Show later this month, and expects a number of Aussies to be there. Ken says that he is taking flying lessons at the local airport to relieve the boredom!

Ken Warby's new boat for the World Water Speed Record (Photo courtesy Ken Warby)

PacifiCat Sale

British Columbia's ferry-operator British Columbia Ferry Corporation has appointed PriceWaterhouseCoopers to manage the sale of its three high-speed catamaran PacifiCat passenger ferries. In March this year, the provincial government announced that it planned to close Catamaran Ferries International, a subsidiary to state-owned BC Ferries, which operated the PacifiCat fast ferries. The PacifiCats, *PacifiCat Explorer*, *PacifiCat Discovery* and *PacifiCat Voyager* are among the largest passenger and vehicle fast ferries in the world. Fully laden, the 122 m ships can carry 1,000 passengers and 250 cars at a speed of 34 kn. PriceWaterhouseCoopers is looking to existing ferry operators and possibly even newly-formed companies to make offers for the three identical ferries. The sale is to be launched officially in August with the three available for immediate delivery.

Lloyd's List, July 24

Megayacht *Georgia*

Georgia's overall length of 48 m makes her the largest yacht built of aluminium, and the biggest single-masted yacht afloat. Her towering 60 m mast is the tallest carbon-fibre stick anywhere, and her sail wardrobe would just about blanket Martin Place or the Bourke Street Mall. She was built in Auckland, NZ, by Alloy Yachts international for US developer John Williams for a reported $NZ50 million to a design by Seattle, USA, naval architect Glade Johnson.

Prevention of pollution by oil tankers – can we improve on double hulls?

Robin Gehling

INTRODUCTION

When *Exxon Valdez* grounded in Prince William Sound, Alaska, on 24 March 1989, few in the oil shipping industry outside the United States could have foretold the regulatory changes which would be triggered by the incident. That impact has included the promulgation and implementation of regulations 13F and 13G[1] of Annex I to MARPOL'73/'78[2] which have had the effect of requiring all new oil tankers of significant size to be built with double hulls for improved pollution prevention.

AN OPPORTUNITY IN TIME

Over eleven years have passed since the *Exxon Valdez* grounding. This is sufficient time for the regulatory changes triggered by that grounding to be bedded down and for their longer term advantages and disadvantages to be evaluated. Following this evaluation, the findings should be acted on as soon as possible to further improve the design, construction, operating and pollution prevention characteristics of tankers constructed in future.

Those changes were, in the first instance, the Oil Pollution Act of 1990 (OPA'90) by the United States and the subsequent adoption of Regulations 13G and 13F of Annex I to the MARPOL convention by the International Maritime Organization (IMO).

OPA'90 requires all oil tankers operating in the exclusive economic zone (EEZ) of the United States to be constructed or fitted with double hulls as of 1 January 1995 or, in relation to existing single-hull ships, such later dates as are specified[3]. A typical double-hull arrangement is shown in Figure 1.

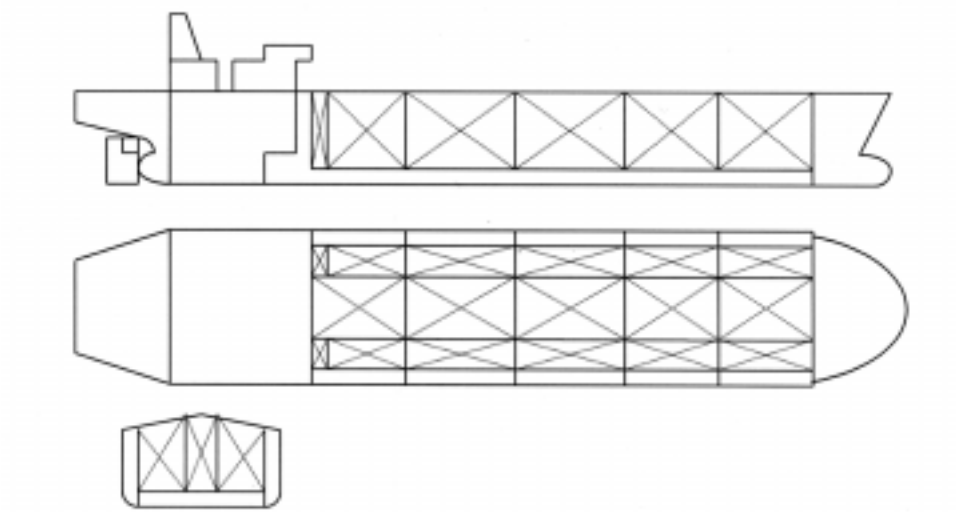


Figure 1 Double hull tanker

MARPOL Reg. 13G provides for existing single-hull tankers to remain in service to no more than 25 years of age, or 30 years if fitted with segregated ballast and protective location of ballast, unless fitted with double hulls meeting the current requirements. Thus tankers built in the late 1960s and early 1970s have reached or are approaching the end of their lives. Regulation 13F requires all new tankers contracted for construction from 6 July 1994 to be built according to double hull or equivalent designs. These phase-in arrangements are less onerous than those imposed by OPA'90.

One clear difference between OPA'90 and IMO requirements is that the former does not allow for acceptance of other designs of equivalent pollution prevention capability to double hulls.

The tragic loss of the tanker *Erika* off the coast of northern France in December 1999 will no doubt have many repercussions, one of which is likely to be the accelerated phase-out of tankers which predate Reg. 13F. It appears likely that either IMO will adopt amendments to Regs. 13F and 13G to more closely reflect OPA'90, or the Europeans will unilaterally introduce an accelerated phase-out schedule for single-hull tankers. Irrespective of the phase-out schedule, it is timely to re-examine the acceptance of designs equivalent to double-hulls as acceptable replacements for single-hull tankers.

As far as I am aware, no tankers have yet been built to 'equivalent designs' as permitted under Reg. 13F(5). This appears to me due to the need for any new tanker to concurrently comply with both MARPOL Annex I and OPA'90 unless the owner is sure that the ship will not be required to enter the United States EEZ during its lifetime and is prepared to accept the re-sale price penalty of being unable to do so. There is no time like the present to remove or at least recognise this barrier.

REDUCTION IN MARINE OIL POLLUTION THROUGH MARPOL '73/'78

Changes in the world-wide task of transporting oil by sea during this century are shown in Figure 2[4]. It will be seen that while this task has varied significantly in the period since MARPOL was first adopted in 1973, it has now returned to levels similar to those of the late 1970s. Taking this into account, Figure 3, derived from the same source as Figure 2, shows a remarkable reduction in annual input of oil into the sea from marine sources over the period 1971 to 1989. This reduction can be attributed to MARPOL '73/'78. Further reductions can be expected to have flowed from implementation of the double-hull requirements in regulations 13F and 13G.

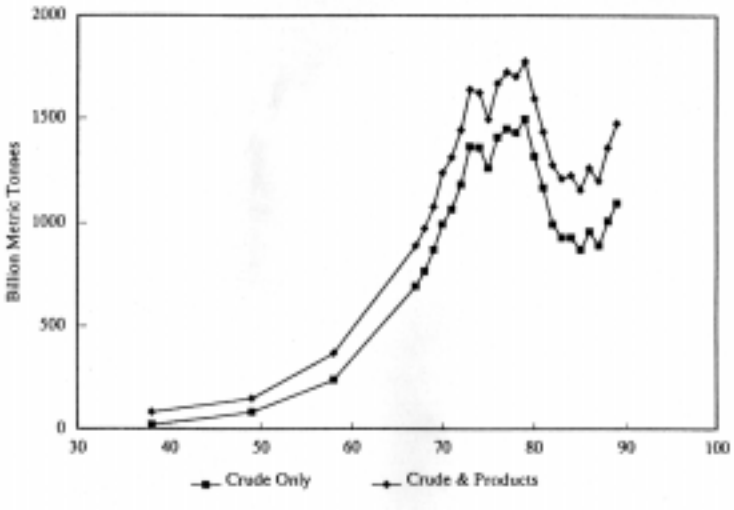


Figure 2 Transport of oil by sea

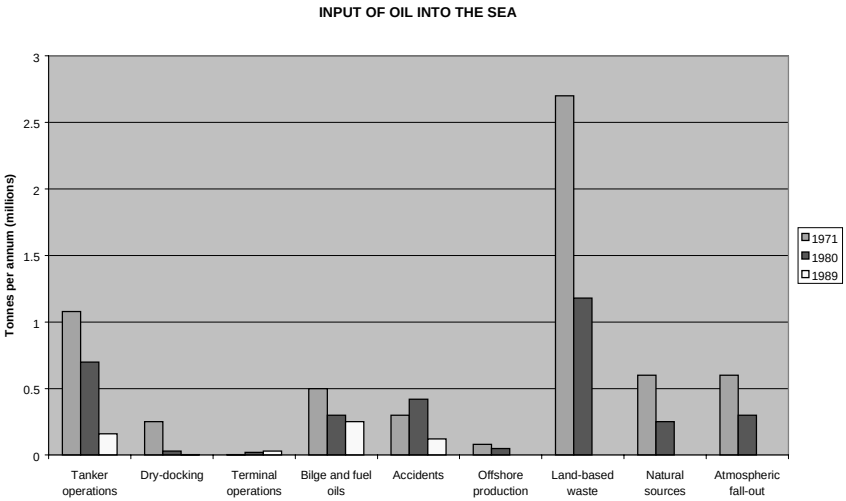


Figure 3 Oil input to the sea
Note: no values are available for offshore & non-marine sources for 1989

The appendix contains back-of-the-envelope calculations demonstrating that the reduction in pollution attributable to MARPOL '73/'78 as amended would pay for the financing cost of the increased cost of tankers compared with their predecessors more than twice over. The oil transport market has changed over this period, so that these calculations simply serve to demonstrate that modern environmentally-friendly tankers are cost-effective and that old-style tankers and tanker operations could not compete with them.

Further information on the cost-effectiveness of various configurations of double-hull tanker designs is given by Sirkar et al. in the report of the SNAME Ad Hoc Panel on the Environmental Performance of Tankers[5].

ADVANTAGES OF DOUBLE HULLS

The double-hull concept was unsuccessfully proposed by the United States at the 1978 Conference which resulted in the 1978 Protocol to MARPOL. Instead, the Conference adopted a concept known as 'protective location,' whereby 30 to 45 percent of the ship's side and bottom hull surface in the cargo tank area is required to be used for ballast and other non-oil tanks and voids. This supplements the 'segregated ballast' arrangement mandated in MARPOL'73. Such an arrangement is illustrated in Figure 4. In pollution prevention terms, this outcome was at least superficially inferior to the 100 percent protective location offered by double hulls. Following the defeat of this concept, the United States kept the proposal in reserve to be re-activated at an opportune moment, such as was presented by *Exxon Valdez*. A typical arrangement is illustrated in Figure 5.

I deliberately used the word 'superficially' in the preceding paragraph because of a number of factors which I will deal with later. However, the double-hull concept has the distinct advantage of readily convincing the layman that two steel barriers between the oil and the ocean has to be better than one. It therefore has good marketability.

From a commercial viewpoint, the fact that the oil tanks within a double hull are generally free of internal stiffening improves crews' ability to minimise 'clingage' of cargo residues and so maximise cargo out-turn.

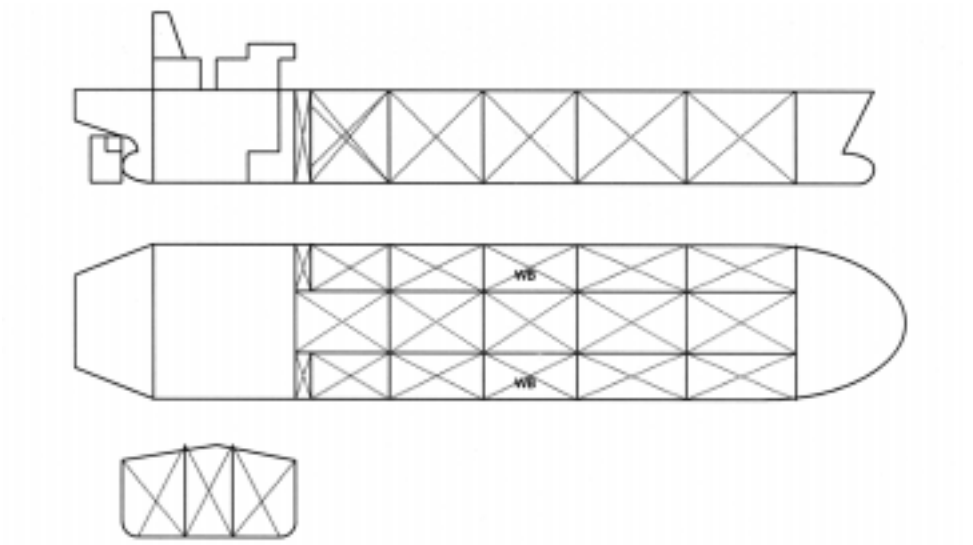


Figure 4 MARPOL 73 tanker

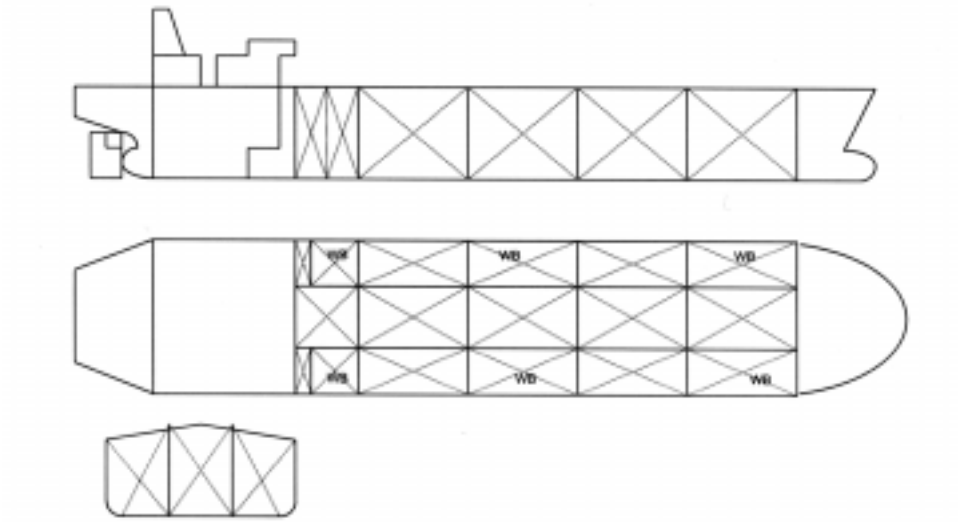


Figure 5 MARPOL 73/78 tanker

DISADVANTAGES OF DOUBLE HULLS

Double-hull tankers have two distinct disadvantages from an intact stability perspective. Firstly, for a given depth of ship, adding a double bottom of between 1 and 2 m height will raise the centre of gravity of the cargo and thereby reduce the ship's reserves of stability. Secondly, free-surface effects in cargo and ballast tanks during cargo operations may cause double-hull tankers to lose stability and suffer an angle of loll, particularly if their design does not incorporate a longitudinal bulkhead sub-dividing the cargo space — procedures necessary to ensure that stability is maintained may restrict cargo operations.

The effectiveness of the double-hull concept from the damage stability and oil outflow perspectives is dependent on the damage being limited to a penetration distance less than the distance between the hulls. In this manner it relies on retaining at least one effective barrier between the cargo oil and the sea. But for typical oils that are less dense than water, such a barrier is not necessarily required as oil will float on water; this fact can be used with other design concepts to improve damage stability and produce oil outflow characteristics superior to those of double-hull tankers.

Crude oil cargoes may require heating to enable them to be pumped. The heating and cooling of the inner hull associated with each cargo can be expected to cause deterioration of protective coatings on the ballast tank side of the vast expanses of structure comprising the inner hull. Maintenance of the effectiveness of these coatings is essential to protect the integrity of cargo tank boundaries, but comprises a high workload for the crew and shore-side gangs. This workload will increase with the ageing of the ship. It can be expected that breakdown of coatings will eventually necessitate major dry-dockings to replace either the coatings or the tank structure and that the relatively large area affected will reduce the economic life of double-hull ships compared with their predecessors.

Tom Moore, President of Chevron Shipping, is quoted[6] as being concerned at the extreme dependency of double-hull ships on protective tank coatings to maintain hull integrity.

Cracking of tank structure may occur, either due to stress concentrations becoming apparent over time or through degradation of structure, noting that protective coatings of cargo tank structure are not a statutory or classification society requirement. Accelerated pitting corrosion of such structure has been observed, including annual pitting corrosion rates of 1–1.5 mm, in relatively new double-hull ships[7]. However, with the exception of the 'vacuum bottle effect' there is little to indicate that this corrosion is any worse in double hulls than single hulls.

Cracks in cargo tank boundaries may become apparent through the detection of hydrocarbons in adjacent ballast tanks. Such situations are anticipated under the 1974 Safety of Life at Sea Convention by the requirement for double-hull spaces to be fitted with connections for the supply of inert gas[8], but control of atmosphere and subsequent tank entry and repair are made more difficult by the presence of double-bottom tanks.

A related structural factor is the issue of accumulation of water ballast sediment. While sediment can be relatively easily removed from side tanks, difficulty of access makes it much harder to remove from double bottoms. Accumulation of this sediment in double bottoms will increase the difficulty of achieving satisfactory inspection of coatings and structure of these spaces, and thus present further barriers to satisfactory monitoring and maintenance of this structure.

Incidentally, the large area of double-bottom tanks in double-hull ships increases the difficulty of fully stripping out ballast and ballast residues, and therefore reduces the effectiveness of the ballast system in preventing the transfer of marine pests in ballast water.

If a grounding incident leads to a breach of the outer bottom in the double-bottom area, the entire ballast tank will be flooded, making the ship more firmly lodge on the bottom and so salvage will be more difficult than it would have been in a single-bottom situation. The actions of wind, weather and sea, particularly the rise and fall of tide, may result in a breach of the inner bottom and release of cargo oil. In a single-bottom situation, the ship would have immediately lost some oil but would have suffered less flooding and so may have been able to be refloated much more quickly.

The current situation whereby there is no commercial alternative to double hulls raises the disadvantage of technological development.

TECHNOLOGICAL DEVELOPMENT

As mentioned above, Reg. 13F leaves open the option of designs alternative to double hulls by incorporating the clause:

Other methods of design and construction may also be accepted as alternatives to the requirements prescribed in paragraph (3), provided that such methods ensure at least the same level of protection in the event of collision or stranding and are approved in principle……

Subsequent to the adoption of regulation 13F, IMO has developed guidelines[9] for use in evaluating whether alternative designs achieve equivalence.

As mentioned above, the United States declared that it would not accept such alternative arrangements on tankers coming into its waters. Accordingly, on the basis that any such equivalent tanker would have to be employed for its entire life on trades which do not involve US waters, no owner or builder has been prepared to commit to such a design.

Two other designs have been developed, the mid-height deck and the Coulombi egg, as outlined below.

The United States position

Personal inquiries have led me to the conclusion that the United States' non-acceptance of alternatives to double hulls is based on the fact that to do so would involve dismantling of one of the cornerstones of OPA'90 — that double-hulls are essential for the prevention of the pollution of the sea by oil. Besides, having established double hulls as an international requirement, everyone in the tanker design and construction industry is working on a level playing field. So the United States appears to see no reason for change.

Mid-height Deck Design

This design, which emerged at the same time that Regulations 13F and 13G were being developed, is illustrated in Figure 6. It features ballast tanks at the sides but no double-bottom tanks. Between the longitudinal bulkheads bounding the ballast tanks are the cargo tanks, subdivided by a deck at or below mid-height, and at least one longitudinal bulkhead to reduce free surface. The lower cargo tanks are loaded with a small ullage space above the cargo so that, in the case of breach of the bottom skin, a water bottom will form and the oil cargo will float up into the ullage space and access trunks,

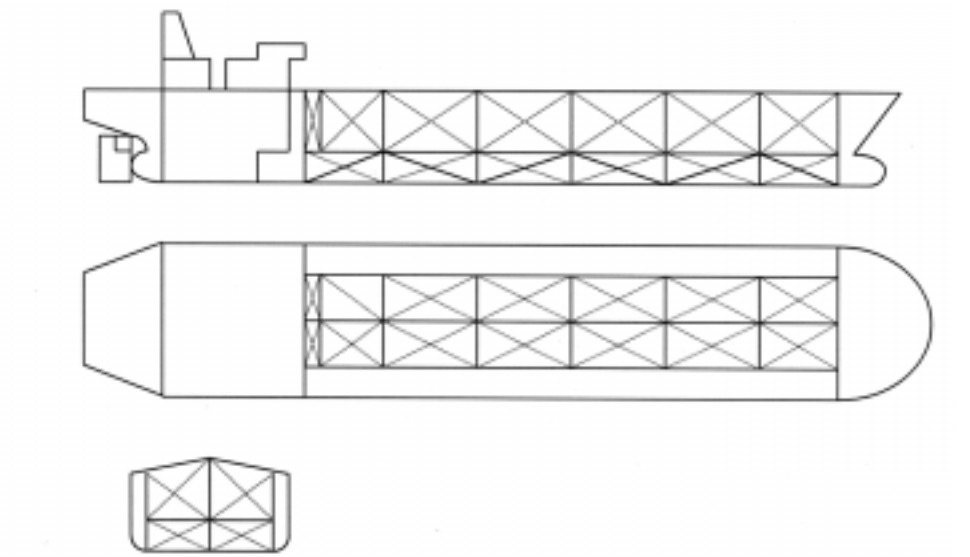


Figure 6 Mid-height deck design

avoiding an oil spill.

As no double bottom is fitted, the side tanks provide all of the ship's ballast capacity. They are therefore wider than the side tanks on double-hull tankers and so, relative to double hulls, provide increased protection in the case of collision damage to the ship's side.

These characteristics, which are superior to those of a double-hull tanker, enabled the design to obtain approval as an alternative to double hulls simultaneously with the adoption of the guidelines for approval of alternative designs in 1995. Despite this, the design was specifically rejected by the United States in 1994[10]. Additionally, Bjorkmann[11] notes that it requires at least one additional longitudinal bulkhead and states that 'the cargo tank configuration becomes impractical with a complicated cargo piping system'.

Sirkar et al. have computed comparable probability distribution factors for double-hull and mid-height deck designs. These show that the mid-height deck design has a much higher probability of producing very small spills, but a significantly lower probability of larger spills than double-hull designs.

Modified Mid-Height Deck Design

In my view the mid-height deck design may be particularly applicable to smaller tankers. While I have not done design calculations for such a design, I would expect that the free surface and cargo tank subdivision could be minimised by use of a cambered mid-deck and an upper deck trunk to minimise the breadth of ullage space. Figure 7 illustrates such an arrangement.

Since cargo tanks are generally filled to 98% of full volume, the problem of having two free surfaces 'stacked' on top of one another is overcome in this arrangement by reducing those free surfaces to a narrow width through use of camber and/or trunks. I believe that this idea warrants further research, particularly in relation to small tankers where it would facilitate reduction in subdivision (e.g. longitudinal bulkhead) that might otherwise be necessary. This concept appears capable of restricting oil

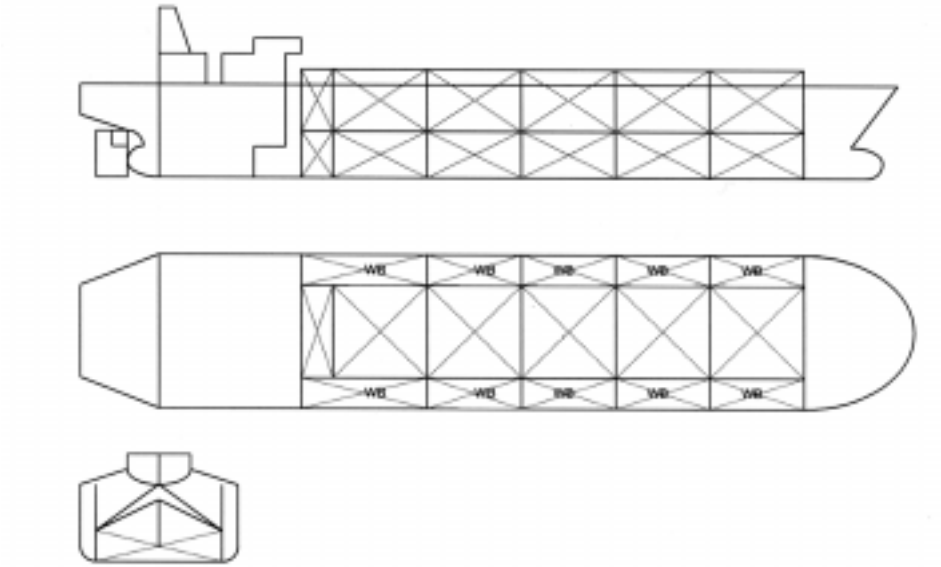


Figure 7 Modified mid-height deck design

outflows to levels comparable to or less than double-hulls, but without the disadvantages of double-bottoms.

'Coulombi egg' Design

A further alternative design, the "Coulombi egg"[12] shown in Figure 8, is a development of the mid-height deck concept. However, it goes further in reverting to single-hull type structure, using a mid-height deck that turns downward as it approaches the ship's sides and has two longitudinal bulkheads. The upper wing tank, which extends well below the waterline is used only for carriage of water ballast and provides protection for the oil cargo against collision damage to the ship's side. If the damage extends down into the lower wing tank, some oil spillage may be prevented by the oil floating up into the upper side tank. All the lower tanks are protected against bottom (grounding) damage in a similar fashion to the lower tanks of the mid-height deck design. This design, which is particularly suitable for the largest of crude carriers due to side damage considerations, was approved by IMO in September 1997 in accordance with the guidelines, but has not subsequently been constructed due, in all probability, to the continuing effective United States veto.

The above two alternative designs demonstrate that tankers which improve upon the pollution-pre-

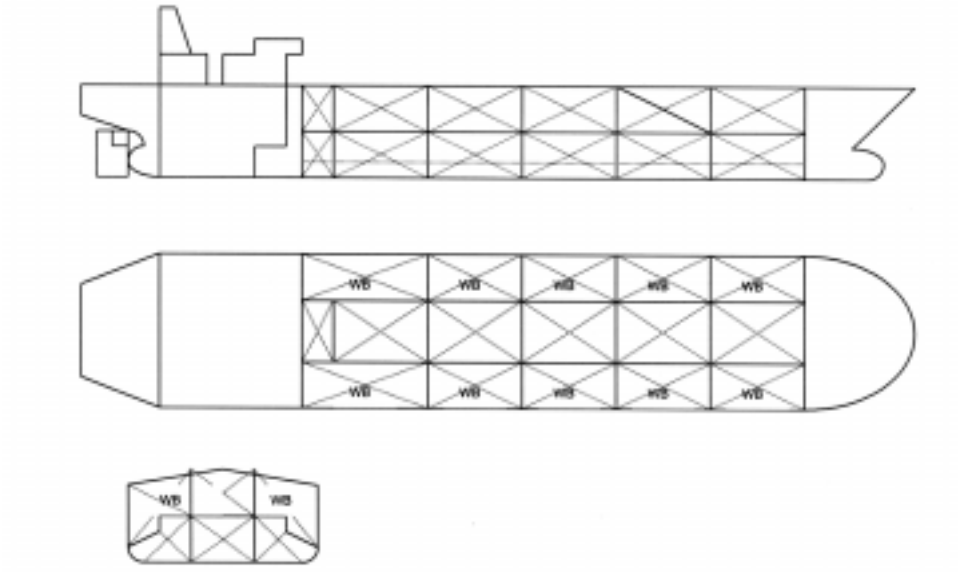


Figure 8 "Columbi egg" design
Note: topside wing tanks, WTS, cargo below

vention effectiveness of the double-hull tanker can be designed and built. Now is the time to recognise that the veto has been effective in preventing these and future improvements from being translated into reality, and to take action accordingly.

FLOATING OIL PRODUCTION, STORAGE AND OFFLOADING FACILITIES (FPSOs)

This issue is peripheral to the 'main game' but remains noteworthy. The Australian oil industry has utilised converted oil tankers as FPSOs since the commissioning of *Jabiru Venture* in the mid-1980s. When regulations 13F and 13G were being developed within IMO the question arose as to whether these vessels, which can disconnect from the production wells in extreme weather, would be

subject to those regulations. It appears anomalous that these vessels should be treated as tankers because of their previous life as tankers, when permanently-moored FPSOs are regarded as fixed or floating platforms, yet are subject to the same hazards with regard to the likelihood of bottom damage. This is recognised in Sirkar's paper.

While IMO handled this matter through a very broadly-applicable interpretation adopted in 1993, the need to review this matter is indicated by the number of FPSOs employed around the world since then and the varying requirements placed on these FPSOs by coastal states. The oil outflow methodology presented in the Sirkar paper may present a basis for further research on this matter, such as by weighting the calculated average annual outflow due to bottom damage according to the average annual time an FPSO is operating off the riser.

Agreed international requirements addressing this matter could form part of an IMO Code for FPSOs which would detail safety and pollution prevention, specifically addressing where the relevant hazards and their risk levels depart from those applicable to trading tankers.

REVISED GUIDELINES FOR EVALUATION OF ALTERNATIVE DESIGNS

IMO is currently considering revision of Regs. 22–24 of MARPOL Annex I relating to the hypothetical outflow of oil[13]. An adjunct to this task is reconsideration of the interim guidelines for acceptance of alternative designs. Much of this work is based on the paper by Sirkar et al. on double hulls, so it is important that the resulting revised guidelines do not discriminate against alternative designs.

COST AND THE HUMAN FACTOR

Consideration of this issue would not be complete without taking into account the interlinked factors of cost and the human element of ship operations.

It is all very well having a better engineering solution than double hulls to the question of pollution prevention, but will consumers and the community bear the cost if that better solution carries an increased cost? The answer has yet to be seen since no tankers of alternative design have been built and may never be built if the community is satisfied that we don't need to improve on double hulls and they remain the cheapest internationally acceptable design. At the moment they are the *only* internationally-acceptable design despite the provisions of Reg. 13F(5). In the same article mentioned above, Moore of Chevron predicts that, as a result of the minimum-standard coatings he sees being applied to ballast tanks and a lack of commitment to maintaining them, we will see many premature structural failures in early double-hull designs.

Just as cost savings can be achieved through maintenance, they can also be achieved through crewing. It should be noted that in the same article Richard du Moulin of Marine Transport Corporation and Intertanko states "a double-hull ship with a bad crew is not safe, and a single-hull ship with a good crew is safe". This reflects the generally-accepted wisdom that about 80% of accidents are caused by human error, with hardware failures the cause of the remainder. The same can be expected to apply to alternative designs for double hulls.

CONCLUSIONS

1. The double-hull concept has substantially improved the pollution-prevention capabilities of oil tankers but was adopted after inadequate consideration of alternatives.
2. The double-hull design appears to have been adopted because of its marketability, rather than being the best option.
3. The position of the United States in not accepting equivalents to double hulls, as provided for in sub-regulation 13F(5), has effectively prevented the construction of designs which are improvements on double-hulls.
4. Re-examination of this situation should not be delayed so that potentially-better options can at last be implemented.

5. The methodology used for evaluation of tanker designs could perhaps be adapted to the evaluation of FPSOs.
6. The outcome of any reconsideration of alternative designs may be subject to factors related to the costs involved and the willingness of the community to bear the costs of improvements in pollution prevention.

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DISCLAIMER

This paper is written from the perspective of a naval architect with over 20 years national and international experience in the regulatory aspects of ship safety and pollution prevention. The views expressed, however, are solely those of the author and should not be taken to reflect those of his employer.

APPENDIX
COSTS & BENEFITS OF MARPOL '73/'78

BENEFITS

Reduced outflow from tanker operations

Reduction 1971–89 from Fig. 2 = 921 000 t
Value at assumed price of $US15/bbl = $US89.2m

Reduced outflow from accidents

Reduction 1971–89 from Fig. 2 = 179 000 t
Value at assumed price of $15/bbl = $US17.3m

Reduced cost of accidents:

Etkin[1] quotes the average worldwide oil spill *clean-up* costs as $US12.99 per gallon (1985$) which equates to about $3 300 per tonne of heavy oil. If all of the reduced pollution by oil tankers in Figure 2 is attributable to MARPOL, then the annual clean-up cost savings correspond to:

Value = 179 000 x $3 300 = $US590.7m at 1985 prices
= say at least $US1,200m at 1999 prices

To this can be added a minimum of perhaps 15% for *compensation* due to lost amenity by fishermen, coastal property owners and tourism operators (among others), say $180m

Total Reduced Cost = $(89 + 17 + 1 200 + 180)m = $1 486m

COSTS

If all of the 1 097 million tonnes of crude oil traded per annum (1989) was carried in 150 000 dwt tankers, each undertaking nine voyages per year, 813 tankers would be employed in this task.

Capital cost of typical brand new ship[2] = $US 43.5m

Assume depreciated value of average ship is half this = $US 21.75m

Value of world crude carrier fleet = 813 x $21.75m = $17 700m

So annual financing cost at 10% interest = $1 770m

Assume increased cost of MARPOL '73/'78 requirements is same as the 15-19% quoted by NTSB for the double-hull requirements.

So annual financing cost of MARPOL (as amended) requirements
= 2 x 0.17 x $1 770m = $602m

RATIO

Ratio of Benefits to Costs = $1486m/$602m = 2.46

ADDITIONAL REFERENCES

[1] Etkin D S, *The Financial Cost of Oil Spills*, Report for Oil Spill Intelligence Report / Cutter Information Corp., Arlington MA, USA, 1994, p.42
[2] *Ship sales*, Fairplay, 22 July 1999, p.44

MISSING IN ACTION

The following members have not told Keith Adams of address changes, and he would welcome any information about their location

Ms E. Tongue, Messrs I. T. Brazier, S. A. Finch, J. F. Keegan, D. McKellar and V. I. Thomsett.

Contact Keith Adams on (02) 9876 4140, fax 9876 5421 or email kadams@zeta.org.au.

Stability Data: a Master's view

Captain J. Lewis
Master, *Spirit of Tasmania*

INTRODUCTION

Accurate stability data is paramount for the ship's master to ensure safe, confident operation of any merchant vessel. Currently, due to many restrictions, this is hard to achieve. While the information contained in the publications on board and the computer programs are accurate, improvements can be made in the area of information download.

I have had 30 years of hands-on experience in the use of stability programs. During that time I have held command of varying classes of vessels, including:

- coastal and international roll-on/roll-off cargo ships;
- international cellular container ships;
- roll-on/roll-off passenger ferries;
- high-speed passenger catamarans

In a perfect world all vessels and cargo terminals would have standardisation of computer stability programs. The technology is currently available to allow access of current vessel conditions in real time at any stage of the cargo exchange and voyage. There is no doubt that this ability would greatly improve the safe operation of merchant vessels.

DATA REQUIRED FOR MODERN MERCHANT VESSELS

Requirements

There are three main areas to consider, as follows:

Departure Port Stability

To optimise the maximum cargo and fuel uplift within draft restrictions of the port and within the vessel's load line and stress limits.

Stability during Passage

Trim and draft are optimised to maximise speed and minimise fuel consumption. Consideration is also given as to whether the specific vessel performs better trimmed by the head/stern/even keel.

Arrival Port Condition

Compliance with draft restrictions and handling characteristics required in the arrival port.

Components used by the Vessel to Calculate Stability

- Lightship (already a constant in the computer program).
- Weights of fuel, ballast and fresh water.
- Allowances for free surface effect.
- Cargo.
- Passenger numbers (including crew and effects).

Restrictions

Time

The time available to calculate the vessel's stability is very limited in three areas:

(a) The chief officer, who is responsible for the calculation of the vessel's condition, has many work roles, only one of which is stability.

(b) The port turn-around time of a modern container vessel is short, and decreasing all the time. A

standard rotation around the Japanese coast is eight ports in seven days. Many Asian ports will commence a cargo exchange, and for varying reasons, suddenly stop the cargo operation and direct the ship to anchorage for hours and complete the discharge/load at a later time. This requires calculation of the vessel's condition at a moment's notice and accurate estimates of cargo status. Unfortunately, detailed cargo status is not always available and tier weights from a printed cargo plan are the only method available to the vessel to input current data into the stability computer.

Instances of these interruptions are:

- Being ordered off the berth with a typhoon pending in Japan. On the last occasion this happened to me approximately 80% of the ship's cargo had been discharged, including cargo for additional ports being placed in temporary stows on deck throughout the vessel. The calculation of cargo on board was only achieved by manually inspecting the remaining cargo. Ballast was maximised which allowed the vessel to proceed to anchorage with a large stability safety margin.
- Singapore regularly requires ships to be moved from the berth due to cargo availability or another priority vessel. This occurs at varying stages of the cargo exchange. Quickly entering tier weights is normally the only method available to confirm that the vessel is within stability safety limits.

(c) The final cargo weights and stowage are normally only available towards the completion of the cargo exchange and sometimes presented at the completion of cargo (which is also the scheduled sailing, i.e. departure time) when many people are competing for the limited time of the ship's staff.

Labour

With the world-wide trend to smaller crews, the chief officer's role and workload is constantly increasing, thus reducing the time he has available for the priority task of calculating the stability.

Ballast

The movement of ballast water is, as far as possible, contained within the vessel both athwartships and longitudinally. This is to comply with AQIS (Australian Quarantine Inspection Service) in an effort to reduce the carriage of contaminated ballast water from one port to another. I believe IMO is heading in the direction of introducing these requirements world-wide. When ballast water is taken on board in foreign ports, as far as possible this ballast is exchanged in deep water on passage. The exchange of this ballast water is often a complicated task to achieve whilst keeping the vessel within the set stability and stress criteria. The silting (build-up of sludge) in vessel's ballast tanks is also considered when any ballast is exchanged or taken on board in any port.

Sequence of cargo operations

A modern container vessel may have up to 5 portainer cranes loading and discharging at the same time, all at different rates, both above and below deck. At the same time ballast exchange, both fore and aft, will be continuous (operated automatically) to keep the vessel within the operating limits of trim and list, thus allowing the cargo operation to continue uninterrupted. Time is once again a major restriction.

Draught, Trim, and Internal Stresses

At all times every effort is made to keep internal stresses (bending moments, torsion, and shear force) to a minimum, both in port and at sea. This is of particular importance on a long voyage where large fuel consumption will occur.

On the ACT 7 class container vessels employed on a round-world trade, bunkers are consumed at approximately 100 tonnes per day with only one bunkering port in Europe, requiring an average bunker uplift of approximately 8 000 tonnes. For a three-month voyage involving many ports with draught restrictions, the fuel-burning sequence from different tanks has to be accurately calculated.

At all times, consideration of the restrictions of draught, trim, internal stresses and the vessel's handling characteristics must be made. A vessel with a small GM (which is within IMO criteria) will regularly increase her draft dramatically with heel when manoeuvring and has to be considered draught restricted in many ports.

The above cannot be calculated within the restrictions mentioned above without the aid of an onboard stability computer.

DATA CURRENTLY PROVIDED

Stability Books

On all vessels with which I have been associated, stability books are an essential form of reference — but reference only. Day-to-day calculations are all performed on the computer.

Generally, the master and chief officer study the stability books approved by the Class society:

- on joining a new vessel;
- prior to dry docking; and
- for obtaining essential background data, for example overall statistics, minimum bow height, MTC and TPC, which are not displayed in standard vessel stability programs.

Stability Computer Programs

At the operator level, the choice of programs is usually limited to whatever is supplied with the vessel. With the exception of new buildings and replacements, the ship's officers have little input in this area.

Verification of the stability program

The accuracy of the on-board stability program is confirmed annually by classification societies and at intermediate intervals, by port state inspections, in addition to the regular checks by ship's officers. Verification is achieved by simply entering a known condition and confirming the results with figures already approved by the vessel's classification society.

EQUIPMENT AND PROGRAMS AVAILABLE

Without a computer program, accurate stability could not be calculated within the constraints of a modern trading vessel. Throughout my career I have used various computer-based ship loading programs, all with cargo input by either individual (TEU) unit or total port cargo using a transfer disk. These programs are still current and effective, but are showing their age.

There are several new programs available. Currently, one which is being introduced throughout Australian container terminals and cargo planning offices, has an enormous advantage over earlier software by allowing the operator to clip and paste sections of cargo around the vessel. This can be both by complete holds, bays or cells, as well as individual units, with the results immediately calculated and displayed in terms of stress, draft, or trim etc. It also displays the basic stability information with no other information to cloud the picture, for example: 'Does the vessel comply with IMO criteria in the current condition — Yes or No?'

IMPROVEMENTS FOR SHIPBOARD EASE-OF-USE

Container Vessel Tier Weights

The ability to quickly load or discharge 'on the computer' sections of cargo, both by port and tier weights, is essential to obtain a good estimate of the vessel's condition in limited time.

Standardisation of Data

Standardisation and compatibility of terminal and ship computer programs would be a great advantage, but is obviously not all that easy to achieve. The supply to the ship of a floppy disk with proposed cargo load and final cargo loaded is essential to obtain a stability condition for departure

within an acceptable time. Unfortunately this is not always available in some ports, therefore requiring manual entering of all containers. An average Australian container vessel carries 2 500 TEU with an exchange of approximately 800 units per port, therefore the requirement for manual input of cargo tonnages is using time which is already restricted.

Damage Conditions

Inclusion of damage conditions in the stability programs would greatly assist vessels in calculating and transmitting their condition after an incident such as grounding, etc. For example, the ability to calculate the effects of flooded compartments, including cargo and void spaces prior to re-floating after grounding or collision, would enable more informed decisions to be made. The program format should be compatible with ship emergency response services (SERS) to ease transfer of data in a high-stress situation.

COMPARISONS OF DIFFERENT TYPE OF VESSELS

Container vessels have been discussed in some detail.

Passenger Roll-on/Roll-off Ferries

Calculation of stability is a little easier for these vessels as the passenger and cargo bookings are similar on most voyages, with seasonal variations only. This allows a pre-calculation of the regular departure condition with final adjustments made shortly before sailing time.

The major difference is that the passenger weights are not restricted to one area and, in fact, passengers can all congregate in any area — 'passenger crowding' is allowed for in the initial calculations. My current command, S*pirit of Tasmania,* has been assigned two freeboards. The change of freeboard is selected depending on passenger numbers.

Once again the calculation of the departure stability is dependent on time, with fast turn-around being a priority. The stability computer on this type of vessel is an essential tool.

High-Speed Passenger Catamarans

The high-speed catamarans with which I have been associated have all been wave-piercers. None have carried or, in my opinion, have required a stability computer. The stability manual and the damage control manual show typical conditions of loading, heeling lever curves due to high speed turns and damage conditions.

Where significantly different conditions occur, manual calculation of the stability is required. The method of calculating the ship's stability in these conditions is shown in worked examples contained in the stability manual. In my experience this has never been required.

The last two wave-piercing catamarans that I have commanded have had a GM (fluid) in the range of 40 to 70 m. The righting lever on these vessels is very large compared to a conventional ship. On one occasion the catamaran fouled the rubbing strake on the wharf fendering (with a rising tide) and then required all four engines to release the vessel — some 40 000 HP.

In all normal loaded trading conditions, these vessels cannot become unstable, when loaded within the criteria of the stability manual.

Damage stability of high-speed craft is a priority for the ship's master. Due to their high speed and lighter construction, the longitudinal extent of damage will be greater than for a conventional vessel in most cases. The most probable damage expected would be associated with a grounding incident. I feel these scenarios are covered adequately in the damage control manual under the headings 'flooded compartments' and 'worst damaged conditions'.

FUTURE DIRECTIONS — POSSIBILITIES

From an operator's perspective, the points to consider in the future are:

- Standardisation and compatibility of on-board and shore-based stability programs.

- Electronic exchange of information before arrival in port and also during the cargo exchange, to allow pre-calculation of stability and more effective use of time.
- Real-time display of current cargo-on-board, possibly direct from the portainer crane or via the terminal weighbridge.
- Electronic exchange direct from the stability program stating the vessel's condition in a grounding, collision or emergency situation.

This paper was presented at STAB2000, Launceston, Tasmania, February 2000

PROFESSIONAL NOTES

ISSC Correspondent Required

The International Ships & Offshore Structures Congress (ISSC) is held every three years in one of the member countries (Australia is an associate member). In this Congress, researchers in ship and offshore structures discuss the most up-to-date progress in these areas and recommend the future needs. The discussion is based on the reports of sixteen technical and specialist committees, prepared over the three-year period and distributed as proceedings just prior to the congress. Participation is strictly by invitation.

Owen Hughes was Australia's first correspondent to the ISSC. Mac Chowdhury attended the 1991 Congress as an observer with Owen, and was elected correspondent at that Congress. Mac has been Australia's correspondent since then, and has attended each of the subsequent Congresses in that capacity. He will attend the 2000 Congress in Nagasaki, Japan, in October, but considers that the time is ripe for someone else to take over as the correspondent for Australia.

This is an invitation to all in the area of ship or offshore structures to consider representing Australia at this three-yearly event. If you would like to know more about what is involved, then please call Mac on (02) 9385 4092, or email m.chowdhury@unsw.edu.au. If interested, then please send Mac a copy of your CV by 15 September for onforwarding to the Standing Committee of the ISSC with his recommendation for election in October.

NMSC Action

The National Marine Safety Committee (NMSC) has the task of implementing the Australian Transport Council's marine safety strategy. This calls for consistent national standards enabling the seamless movement of vessels and personnel between Australian states and territories and the development of a national recreational boating safety system.

The NMSC has been quietly achieving at Rozelle Bay and has made significant progress on the development of commercial and recreational boating safety system modules. The developments include:

1. National Consistency in Marine Safety Administration

(a) National Survey Certificate

This has involved a change in approach to achieve a single national survey certificate, recognised by all jurisdictions and has involved the assessment of obstacles to mutual recognition.

(b) National On-board Safety Guidelines

The final report was submitted for Ministerial approval on 8 May, and NMSC is awaiting a response from some states/territories.

(c) Safety Equipment Standards

Commercial Vessels: Progress has been made on the majority of issues and a number are under further review. As part of the process, a consultant has been appointed to review anchoring arrange-

ments. Further input from jurisdictions and key industry stakeholders will be needed to complete the review of this part of the National Standard for Commercial Vessels (NSCV).

Recreational Vessels: The first round of public consultation has been completed, with forums having been held in each state. A discussion paper is being finalised as the basis for further public review.

2. National Standard for Commercial Vessels

The NMSC is developing a new National Standard for Commercial Vessels to replace the Uniform Shipping Laws Code. The new standard will incorporate an updated USL Code as a prescriptive standard, but there will also be a performance-based standard for those with the expertise to justify their solution.

Progress has been made on the following modules:

Part A — Safety Obligations

This standard is ready for release for public comment.

Part B — General Requirements

This standard is being finalised by the reference group and a regulatory impact statement (RIS) is being considered by the Office of Regulation Review (ORR) prior to release for public comment.

Part C Section 5 — Engineering and Associated Sub-sections

This standard and the RIS are ready for public release, with the RIS awaiting approval by the ORR.

PART D — Crew Competencies

This standard is undergoing final draft for NMSC approval and Ministerial endorsement at the next meeting of the Australian Transport Council, and the RIS has been approved by the ORR.

Part F — Fast Craft

Following the Workshop on Fast Craft held by the NMSC in Sydney on 4 and 5 May, this section has been revised into two sub-sections; the first covering large sea-going fast craft (largely in accordance with IMO's HSC Code), and the second covering all other fast craft (based on Det Norske Veritas' risk-matrix approach for domestic craft). A reference group comprising twenty-one volunteers and deputees from all states has been established, and the revised draft will be considered by the reference group before going out for public comment.

To keep up-to-date with what is happening at the NSMC and where sections of the NSCV are up to, in particular those calling for public comment, keep a weather eye on the NMSC website, www.nmsc.gov.au.

Phil Helmore

'I think we are being followed!' An unusual perspective of HMAS *Jervis Bay* during a recent visit to Brisbane. (RAN Photograph)

Forum on Professional Development

The technical meeting of the Western Australian Section on 19 July was a discussion on Initial and Continuing Professional Development (IPD and CPD), led by a panel representing recent graduates, industry and academia. The majority of those attending were recent graduates, with a handful of elder brethren also present. The RINA requirements were outlined (see the RINA web site if you are not familiar with them) and compared with those of other professional bodies. It was noted that a number of recent (and not so recent) graduates choose not to join RINA or other professional bodies, as they hold a view that those bodies have limited relevance. Clearly, this needs to be addressed.

There was consensus that a qualified naval architect requires breadth of experience, with the job description akin to that of a systems engineer or project manager. The naval architect has (or should have) overall responsibility for vessel design and/or construction. In order to meet this responsibility she or he requires an understanding of all aspects of the process. A number of instances were cited of major gaps in this understanding.

Formal training programs after graduation are now as rare as hens' teeth in Australia, so much of the discussion focussed on how to get training in a ship design or construction company. One of the drawbacks of working in a large company is the risk of staying in one technical area, rapidly becoming an 'expert' at the expense of a broader understanding of ship design. It was agreed that shop-floor experience was a very important component.

A pro-active attitude is required in order to gain useful experience, e.g. to attend inclining experiments or ship trials (a straw poll showed almost all had done these two). There was limited direct recognition of professional development by employers in terms of time off or salary; rather it was taken into account in performance reviews and appraisals. CPD has to be supported both from top management and by new graduates.

From the employers' perspective, it was recognised that a formal method of tracking the professional development of their employees was needed, as it benefits the company as well as the individual. This led to the question of who pays for CPD? There was consensus that the costs should be shared between the individual and the employer. Whilst it was recognised that the community also benefited (safety, environment etc.), government is rapidly backing out of subsidised education, with full fee recovery required for most postgraduate and short courses. Those present were willing to contribute half their CPD hours from their own time if the employer matched it with time off from normal work duties.

It was agreed that the minimum 35 hours p.a. CPD required by RINA was too low; it is less than half that achieved in many successful companies. [50 h p.a. average is required by IEAust — Ed.] The question was raised as to whether input hours was an appropriate measure of CPD, when the goal should be outcomes and improvements.

The advantages of becoming CPEng and registering on NPER-3 (IEAust) were also discussed. Interestingly, nobody was absolutely certain of the legal implications of these two steps. The advantages of NPER-3 registration (in NSW and WA at least) were perceived as liability capping, review of disputes by peers, and greater community standing (e.g. as an expert witness). However, whilst the implied advantages were clear, there was no definitive answer as to the difference between a CPEng 'signing off' on a ship and a non-CPEng signing off — especially when things go wrong.

Where to from here? RINA needs to push for and assist with implementing training programs within industry — accredited or unaccredited — just to get things going. The WA Section committee intends to produce a paper on the subject for the use of local members to discuss with their employers.

Kim Klaka

Breadth of orders for Wärtsilä 200 engines

Two recent orders for Wärtsilä 200 diesel engines demonstrate the diversity of possibilities for these compact prime movers available from Wärtsilä NSD Corporation. Transocean SedcoForex of Houston, Texas, has ordered four Wärtsilä 12V200 generating sets for re-powering their Transocean 135D semi-submersible offshore platform. These 2 020 kW generating sets will be delivered in October this year and will be installed while the semi-submersible is on station in Brazil. This is the fifth platform for which Transocean SedcoForex has selected Wärtsilä 200 generating sets.

In addition, Fincantieri in Italy has ordered two 12V200 main engines to power the diesel-electric propulsion system of a new multi-purpose support vessel contracted by the Italian Navy. These engines have a combined output of 4 800 kW at 1 500 rev/min. This order is a breakthrough for Wärtsilä 200 marine engines in naval applications. Compact size and superior load-acceptance capability were the selection merits for Wärtsilä 200 engines.

The Wärtsilä 200 engines are built in Mulhouse by Wärtsilä NSD France SA, a dedicated product company for the development and manufacture of Wärtsilä 200 and Wärtsilä 220 engines, and for providing application engineering services and after-sales support. With cylinder dimensions of 200 mm bore by 240 mm stroke, Wärtsilä 200 engines are built in 12, 16 and 18-cylinder vee-form configurations covering a continuous output range from 2 100 kW to 3 600 kW. With nominal running speeds of either 1 200 or 1 500 rev/min, these engines have a high power concentration.

Following the termination of the Cummins–Wärtsilä joint venture in December 1999, the Wärtsilä 200 diesel engines and Wärtsilä 220 gas engines were re-integrated with the Wärtsilä NSD Corporation product range from the beginning of January 2000. Wärtsilä 200 diesel engines are used in both marine and land-based applications, whereas the type 220 gas engines are used currently in land-based applications.

Since the introduction of the Wärtsilä 200 engine design in 1994, more than 300 engines have been shipped to customers in both marine and land-based applications. With their benefits of compact size and heavy-duty features, the Wärtsilä 200 diesel engines have achieved a significant market share in offshore power generation applications all over the world. Other significant applications for Wärtsilä 200 marine engines include passenger vessels up to 120 m in length and naval craft.

USN to use Electric Drives

The US Navy has decided to adopt a propulsion system using electric drive to provide its ships with greater efficiency and flexibility, and opening the way for the introduction of new technologies such as permanent-magnet motors and high-temperature super-conducting motors. The new propulsion system will be incorporated into the US Navy's coming DD21 destroyer. Problems associated with conventional drives include alignment of shafting, noise associated with reduction gears, noise path direct from engines to the water via the shafting and hull, inefficiency of diesels or turbines at slow speeds, and the separation of propulsion and power generation systems.

With electric drive, the power generated is fed to a distribution system, and can be allocated as needed for propulsion or power. The reduction gears are replaced with quieter generators and motors, having shorter shafting which is easier to align, cabling eliminates the shafting noise path direct from engines to the water and resilient mounts avoid the propagation of noise into the water via the hull.

A contract has been signed by the American Superconductor Corporation of Westborough,

Massachusetts, and the US Navy's Office of Naval Research to design a 25 MW high-temperature super-conducting motor for naval ship propulsion systems. This is expected to be about one-fifth of the size and weight of a conventional engine of the same power.

Engineering World, June/July 2000

[Flexibility — yes; efficiency — someone should tell the USN about the overall efficiency of electric power generation — Ed.]

THE INTERNET

Viruses

No-one can afford to be without anti-virus software these days. One feature to look for when purchasing is the provision of "live updates" of the virus definition files, where the software looks up the website for the latest definition files, downloads them and installs them, pain-free and quickly (compared to manual installation). Updates run more quickly the more often you schedule them, and weekly is not too often.

The Symantec website at www.symantec.com has one of the best virus encyclopaedias around, for both real and hoax viruses.

UNSW Course Material

The University of New South Wales has a policy of placing course material on the web, and the School of Mechanical and Manufacturing Engineering is following suit. For example, you can inspect the course details (about two pages each) for NAVL3100 Principles of Ship Design, NAVL3700 Ship Propulsion and NAVL4720 Marine Engineering on the School's website www.mech.unsw.edu.au. Click on the Course Materials button on the home page, then on the subject number (arranged in columns), and finally double-click on the subject number CO.PDF file. You will need to have V4 of Acrobat Reader already installed, and this is freely available from the Adobe site, with a link to get there. Other course details are being placed on the site as they become available. You will not be able to access the class notes, as student number and password are required, but course details are freely accessible.

Bureau Veritas Ship Survey Information

Bureau Veritas have issued a new ship management system worldwide. It is currently being installed in Australia and New Zealand and will, by the end of August, enable BV clients to access classification and survey information for their own vessels over the Internet.

WebMatchIt Search Engine

The world's fastest and most accurate search engine, recently voted "World's Best Search Engine" by NPD Online Research, is now specifically designed for Australians. WebMatchIt's search engine technology enabled ninety-five percent of surveyed users to find what they were searching for all of the time.

"It's fast, easy to use, and gives you what you need," said WebMatchIt managing director, David Delaney. "Research shows that the web is getting large and complicated; it has hit one billion pages and is climbing. This enormous amount of information requires a specialist search engine to make it quickly accessible and useful. The WebMatchIt search engine is lightning fast, with results of searches taking less than half a second on average."

Time magazine in April 2000 said that "It is to its competitors as a laser is to a blunt stick."

A key benefit of the WebMatchIt window is that you can choose to search the entire web, Australian-only websites, or the comprehensive online Australian business directory.

To access this powerful search tool, go to www.webmatchit.com.au for a free download.

Phil Helmore

MEMBERSHIP NOTES

Australian Division Council meeting

The Australian Division Council met on 14 June, with teleconference links to all members and the President, Bryan Chapman, in the chair in Melbourne. Robin Gehling was unanimously elected Vice-president of Council to replace John Colquhoun, who stepped down from that position at the conclusion of the previous meeting. Matters, other than routine, which were discussed included the Heads of Agreement between IEAust and RINA (Australian Division); a website for the Australian Division; closer cooperation with the Kansai Society of Naval Architects, Japan; joint technical meetings with MARENSA (as a learned society of IEAust); the RINA submission to the Defence green paper; and sponsorship for your favourite journal.

RINA Committee Members

To keep members up-to-date with who is doing the hard yards for the Institution, all committees will be published annually. Current committees are as follows:

RINA London

Members: Bryan Chapman and Noel Riley

Australian Division

President: Bryan Chapman
Vice-president: Robin Gehling
Secretary: Keith Adams
Treasurer: Allan Soars
Members appointed by Sections:
Tony Armstrong (WA) Phil Helmore (NSW)
Ken Hope (Vic) Brian Hutchison (Qld)
Bruce McNeice (ACT) Martin Renilson (Tas)
Members appointed by Council:
Jim Black Werner Bundschuh
Phil Hercus John Jeremy
Ian Laverock

ACT Section

Chair: Ian Laverock
Deputy Chair: Dave Magill
Secretary: Bruce McNeice
Assistant Secretary: Martin Grimm
Treasurer: Nick Whyatt
Members: John Colquhuon
Robin Gehling Tim Lyons
Warren Smith Robert Thomson

NSW Section

Chair: Phil Hercus
Deputy Chair: Phil Helmore
Secretary: Jennifer Knox
Treasurer: James Fenning
Members: Lina Diaz
Don Gillies Rod Humphrey
Todd Maybury Paul O'Connor
Allan Soars

Queensland Section

Chair: Brian Robson
Deputy Chair: Geoff Glanville
Secretary/Treasurer: Brian Hutchison
Members: Andrew Harvey
Stephen Plummer Chris Ramsay
Ron Wright

Tasmanian Section

Chair: Martin Renilson
Deputy Chair: Gordon Kenworthy-Neale
Secretary: Tim Nicol
Treasurer: Steven Wall
Members: Richard Boult
Stephen Cook Martin Hanlon
Garnett Henderson Alex Nolan
Colin Spence Alistair Verth

Victorian Section

Chair: Tom Kirkpatrick
Secretary/Treasurer: Ken Hope
Members: Tony Armstrong
Samantha Tait

Western Australian Section

Chair: Tony Armstrong
Deputy Chair: Hugh Hyland
Secretary: Jim Black
Treasurer: Damian Smith
Members: Steve Harler
John Wood Kim Klaka

Phil Helmore

NAVAL ARCHITECTS ON THE MOVE

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

There have been a number of further changes within the Austal group (not mentioned elsewhere), as follows: Chris Norman (Director Sales); Glenn Williams (Manager Sales); Jim Black (Manager Service); Tony Armstrong (Manager Research and Development) with naval architect Peter Randhawa; Tim Speer (Manager Advanced Engineering); Derek Gill (Manager Project Design) with naval architects Bernard O'Shea, Eric de Brey, Frank Ryan, Grant Brunsdon, John Drake, Martin Cabot, Sam Abbott, and Tim Mak; Gordon Blaauw (Manager Image Design) with naval architects David Lugg, Damien Smith and Emma Tongue; Tony Elms (Manager Seastate) with naval architects Jon Gould and Paul Steinmann; Tim Brazier in Marketing Design and Michael Henderson-Kelly, Chris Tucker and Habibul Ahmed in Marketing Support.

Nick Barratt has taken up a position with WaveMaster International in Fremantle.

Craig Boulton has moved on from Advanced Multihull Design to take up a position as a naval architect with Burness Corlett Australia in Sydney.

Luke Chang has moved on from Sirius Marine Design in Queensland to take up a position with Warwick Yacht Design in Auckland, NZ.

Larissa Deck has moved on from Elliot Bay Design Group to take up a position as Project Manager at Delta Marine in Seattle, USA.

Tim Dillenbeck has been promoted within Det Norske Veritas and has now taken up the position of Regional Manager for Australia and New Zealand.

Richard Dreverman, a recent graduate of the AMC, has taken up a position as a naval architect with Austal Design Services. Originally from Orbost in country Victoria, he boarded at Caulfield Grammar School in Melbourne and wanted to be a naval architect ever since he learned about the best profession in a Year 6 High School careers excursion. Water sports also (ahem) steered him towards his career.

Matt Duff has moved on after four years at Advanced Multihull Designs and has taken up a position with Austal Design Services.

Jareth Ekin, a recent graduate of the AMC, has moved on from Cougar Catamarans on the Gold Coast and has taken up a position as a naval architect with Austal Design Services.

Steve Fitzsimmons has moved on after four years at Advanced Multihull Designs and has taken up a position with Austal Design Services.

Stuart Friezer has moved on from Waterline Technologies, and is consulting as Stuart Friezer, naval architect, in Sydney. He is working in conjunction with Incat Tasmania on the design of their next-generation vessel, a 120 m WPC.

John Garbutt retires at the end of August from the position of Principal Representative, Maritime and Ground Systems (Victoria) at Williamstown, after a lifelong career with the Department of Defence, with what is believed to be a significant package. John started as an apprentice boilermaker at the (then) naval dockyard at Williamstown, went on to earn his diploma in naval architecture under Bob Herd at RMIT, and his BSc(Tech) degree in naval architecture under John Tuft and Owen Hughes at UNSW. He spent time at Navy Office in Canberra, time as ANCLO (Australian Civilian Naval Liaison Officer, for those under 50!) in Bath, UK, and returned to the dockyard in Williamstown to oversee the construction of the FFGs by Amecon and the Anzac frigates by Tenix. Life at the dockyard may go on, but it will not be the same without him.

Dean Gregorevic has taken up a position as Naval Architect with Aquarius International Consultants in Perth.

Richard Hallett has been promoted with Principal Representative Maritime and Ground Systems (Victoria) at Williamstown. He takes over the position of Principal Representative at the end of August, while remaining as Chief Engineer within the organisation, overseeing the construction of the Anzac frigates by Tenix.

Graham Jacobs has moved from Geraldton and has started work on his PhD on loads and mo-

tions of high speed craft under the supervision of Prof. Mike Davis at the University of Tasmania.

Irek Karaskiewicz has moved on from the Department of Defence in Canberra and has taken up a position as a naval architect at the Remontowa shipyard in Gdansk, Poland, one of the largest ship repair yards in the world. Irek came to work for Defence from Austal Ships several years ago, but then returned to his native Poland on leave for an extended period before resigning and taking up his new position. He writes that he is enjoying the fantastic people, job, and ships.

Arthur King retired from the Department of Defence in October 1999 and has moved to the Gold Coast. His address, for peripatetics and scribes, is 8 Kurrawa Ave, Mermaid Waters.

Geoff Leggatt has been promoted within Oceanfast Marine in Fremantle and has now taken up the position of Design Manager.

Steve Kretchmer has taken up a position as a naval architect with Aquarius International Consultants in Perth.

Richard Liley graduated from the AMC in 1996 and commenced work with Michael Rickard-Bell and Associates and, during two-and-a-half years, worked on projects such as the 50 m oil-bunkering tanker now based in Port Melbourne, and the 35 m Raymond Island (Gippsland Lakes) ferry. He then moved to Tenix Defence Systems in Williamstown where he worked on the Anzac Ship Project, mainly in production engineering, support, dockings, launchings, inclinings, etc. He has recently moved on from Tenix, and taken up a position as a naval architect with Austal Design Services.

Murray Makin has taken up a position as a naval architect with ADI Marine at Garden Island, NSW, returning to his old stamping ground.

Shinsuke Matsubara, a graduand of UNSW, has moved on from Graham Parker Design and has started work for his PhD in ship motions under the supervision of A/Prof Lawry Doctors at UNSW.

Scott Maynard has moved on from Alloy Yachts International in Auckland, NZ, to take up a position with Dubois Yachts in Southampton, England.

Carl Morley has taken up a position with Innovatech Engineering in Mornington, Vic.

Kev Nonsopa, a recent graduate of The University of New South Wales, has taken up a position as a contract drafter with ADI Marine at Garden Island, NSW.

David Pryce, who has made six Antarctic expeditions aboard Don McIntyre's *Spirit of Sydney* and competed in the 1999 Melbourne–Osaka yacht race with Teresa Michell aboard the Adams 10 *Montane*, is now planning to compete in three single-handed around-the-world yacht races. He intends to sail an International Open One-design 50-footer, currently being built at McIntyre Marine Composites at Taree, NSW, in the Together Alone race from Hobart, the Around Alone from Charleston, USA and the non-stop Vendee Globe from France, a total of 78 000 n miles!

Elizabeth Reynolds, who completed her MPhil degree at AMC in 1999, has moved on from Glosten Associates in Seattle, USA, and is consulting in Seattle.

Thuy Sy Phan has started work for his PhD at the University of Southampton, England.

Doug Rowling has moved on from Tenix Defence Systems at Williamstown in the great outsourcing of technical expertise on the Anzac frigates to Sinclair Knight Merz, and has taken up a position as Principal Design Engineer on the Type 45 Destroyer Project in Glasgow, UK.

Graham Taylor has moved on from Holyman and is now consulting as Taylortech in Sydney, providing general consulting and specialised services in the areas of conceptual design, project evaluation, and the preparation of specifications and contract documentation.

Giles Thomas has moved on from the Centre for Marine Science and Technology at Curtin University and has taken up a scholarship to do a PhD on loads and motions of high speed craft under the supervision of Prof. Mike Davis at the University of Tasmania.

Amit Trivedi's friends will be pleased to know that he is working for Det Norske Veritas in Mumbai, India, where he has been since 1994.

Nigel Watson has moved on from the University of Tasmania and has taken up a position with Seastate, part of the Austal group, in Fremantle.

Richard Whittaker has taken up a position with Larry Ellison's Seattle-based America's Cup syndicate.

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 be very helpful if you could tell 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

VALE

Frederick Lawrence Harrison

Lawry Harrison died shortly before Easter, at the age of 77. A Fellow of the Institution, he joined the RINA in March 1954, was a foundation member of the Australian Branch, and a member of Council from 1955 to 1959.

Lawry started as a Cadet Ship Draughtsman at Cockatoo Dockyard in February 1940, and studied naval architecture at the Sydney Technical College, graduating with a Diploma in Naval Architecture. He rose to the position of Senior Naval Architect at Cockatoo before he left in 1967 for the Adelaide Ship Construction Company in South Australia, where he became Assistant General Manager. He returned to Cockatoo Dockyard in 1977 as Technical Manager, and retired in 1986.

A keen yachtsman, with considerable inshore and offshore experience, Lawry fitted out his own yacht *Waituri* which he sailed in Sydney waters for many years.

A fine naval architect and a true gentleman, Lawry Harrison will be greatly missed by all his friends and colleagues.

John Jeremy

Lawry Harrison

Charles Douglas Janes

Douglas Janes died peacefully in Adelaide on the evening of 2 August 2000 in his 75th year.

Douglas, who was born in Victoria, British Columbia, went to sea in the merchant service in 1943. After obtaining his Foreign-going Master's Certificate he studied naval architecture at Glasgow University from 1953 to 1957, graduating BSc in Naval Architecture.

He joined the Marine Division of the UK Department of Transport in 1957, serving in Glasgow, Bristol and London.

He came to Australia in May 1969 with his wife and family to join the Marine Survey Branch of the Australian Department of Transport. After a short time he transferred to the Ship Structures Safety Branch where he remained until retirement in March 1982. He then became the Head of the Marine Survey Section of the South Australian Department of Marine and Harbours where he remained until his second retirement. He was closely associated with the *Falie* restoration as a director of *Falie* Projects Limited.

Douglas was of a cheerful, outgoing nature, which made for friendly relations with all with whom he came into contact.

A lively memory is of Douglas in the witness box at the *Blythe Star* Court of Marine Inquiry, using his lunch box partly full of water to demonstrate the effects of free surface,

It was indeed a pleasure to work with him and I have fond memories of our 13 years' association in the Ship Structures Safety Branch. He will long he remembered.

Bob Herd

FORENSIC NAVAL ARCHITECTURE

SOME MARINE CASUALTIES EXERCISES IN FORENSIC NAVAL ARCHITECTURE (PART 6)

Robert J Herd

12. THE FOUNDERING OF THE SYDNEY FERRY *KARRABEE*

THE FERRY RACE OR FERRYTHON

The idea of a ferry race on Sydney harbour was conceived by a ferry 'buff' and historian, Mr J. R. W. Allen. Mr Allen's idea was that the event would not be a race as such, but that the ferries would follow a prescribed course, being so placed in relation to their speeds that the faster ferries would follow a longer route so that the ferry positions would be regulated. The event would conclude with a dash from Fort Denison to the Sydney Harbour Bridge.

The first race was held in 1980. *Karrabee* won the second race in 1981. The organisation of the race was then taken over by the Sydney Festival and the final dash was extended to be from Bradley's Head to the Bridge.

During the race on 22 January 1984, five ferries took part: *Kanangra*, *Lady Street*, *Lady McKell*, *Lady Cutler* and *Karrabee*. The course was laid from the Harbour Bridge, west to round Cockatoo Island, thence easterly to round Shark Island. The ferries then lined up for the dash back to the finishing line at the Harbour Bridge. Because of the close proximity of the ferries and the hundreds of spectator craft, the waters of the harbour were unusually disturbed. All the ferries successfully completed the course, but on its return to Circular Quay, *Karrabee* sank at its berth about an hour after arrival.

THE SYDNEY HARBOUR FERRY *KARRABEE*

Karrabee was built in 1913 by Morrison and Sinclair at Balmain as a wooden steamship for the Parramatta River Service. In 1936/37 she was converted to diesel propulsion with a Gardner 6 cylinder engine. This was replaced with a Crossley 6 cylinder engine in about 1961. The original steam engine is now in the Power House Museum.

The principal characteristics were:

Measured length:	36.30 m
Beam:	7.77 m
Depth:	2.83 m
Gross Tonnage:	152.77 tons

The hull was double-ended, with a rudder at each end. There was a single propeller at the stern and she was navigated from a wheelhouse at each end of the upper deck. The hull was subdivided into five compartments by timber bulkheads:

No. 1	Forepeak
No. 2	Forward void space
No. 3	Engine room
No. 4	After void space
No. 5	After peak

Karrabee was provided with three pumps:

- a main engine pump driven by the single diesel engine;
- a shaft pump; and
- an electric general service pump.

She was certified to carry 642 passengers; 492 on the main deck and 153 on the upper deck.

A significant feature of the vessel was the presence of 16 openings approximately 500 mm long by 150 mm high with coamings about 150 mm high above the main deck. There were four on each side at each end of the main deckhouse. The forward and after pair of ventilators served the fore and after peaks respectively. The voids were served by three ventilators on each side. These ventilators (which were covered with wire netting) were left over from the vessel's coal-burning days when they served to ventilate the coal bunkers. Because of the passenger seating fitted against the house sides, these ventilators were not readily visible.

Karrabee was normally crewed by a master, an engineer and two deck hands. The ferry was classed as a Class I vessel, which is one carrying persons in addition to the master and crew in smooth waters. The smooth waters were not defined, but the Harbours and Rivers Certificate which was prepared (but not issued) stipulated limits in the Inner Harbour which were defined in terms of wave heights not being in excess of 1.5 m (trough to crest). At the time of the 1984 Ferry Race, *Karrabee* was owned and operated by the Urban Transit Authority of New South Wales (UTA).

EVENTS PRIOR TO 22 JANUARY 1984

Karrabee was refitted and surveyed annually and was withdrawn from service for refit between 9 September 1983 and 19 January 1984. On 17 January 1984, when the vessel was taken out on trials, water was entering No. 2 and No. 4 spaces when underway. The inflow into No. 2 space was described as 'like a heavy garden hose'. When stationary the vessel leaked only a little.

On 18 January the Maritime Services Board of New South Wales (MSB) surveyors made their declarations that the vessel was in good condition and fit for the issuance of a Harbours and Rivers Certificate. On 19 January, when the vessel entered service, it was found by the crew to be in a dirty and unsatisfactory condition, the engine controls and forward steering were stiff and the vessel leaked, requiring the pumps to be kept going. On 20 January, it was found that the two oil boxes on the shaft bearings in No. 4 compartment were filled with water, indicating that the water level had at some time been above shaft level, an estimated 2.5 to 3 ft. During its ferry runs the vessel leaked constantly into No. 4 compartment at varying rates, the water coming in near the stern gland. On 21 January when the engineer came aboard he found (despite the vessel having been pumped out) a lot of water in the engine compartment and in No. 4 compartment where the water level was about 2 feet deep and touching the shaft. Again the oil boxes were filled with water, indicating that the water had been above shaft level again.

The fact that the oil boxes had been filled with water twice in 48 hours indicated serious problems with the vessel's watertightness, The amount of water being taken in around the stern and probably through the topsides was beyond the capacity of the pumps and the vessel was taken out of service. A decision as to the ability of the vessel to participate in the ferrython the next day was deferred till the next morning.

THE FERRYTHON

After an inspection on the morning of 22 January, the vessel was said to have been pumped dry and the decision was taken for her to participate in the ferrython. The crew reported the compartments empty and dry, and the engineer said that the water under the engine room plates was 'no more than normal'. Once again the oil boxes were filled with water, though this did not cause concern.

The charterers loaded their gear and provisions aboard and *Karrabee* then moved to Man-o'-War Steps to load passengers and receive a briefing. About 350 passengers were loaded — just over half capacity. The ferrython commenced at 1100 and the ferries proceeded towards and around Cockatoo Island, thence towards Shark Island. The passengers tended to collect in the most favourable vantage points — in this case the fore end of the *Karrabee*, which of course tended to reduce the freeboard forward. An observer at Balmain noted that the ferry was down by the head. Shortly after passing

Garden Island the *Karrabee* was overtaken by a hydrofoil ferry which passed between her and *Kanangra*, which were about 50 to 60 feet apart. The wash from this close-quarters encounter was thrown onto *Karrabee's* main deck. About a minute after the hydrofoil overtook *Karrabee*, the latter's steering motor stopped. On investigation, the fault was found to be electrical and, after repair, the *Karrabee* had to chase the other ferries to Shark Island. Because of the close proximity of the ferries at the time of failure, there was a potential for collision which was avoided.

On the way back to the Harbour Bridge the water conditions became extremely turbulent. *Karrabee* was taking a large quantity of water over the bow, due in part to the trim caused by the water in the forward spaces and in part to the harbour conditions. These conditions were more disturbed than was common during normal ferry operations. Water was seen ankle deep on the forward part of the main deck, necessitating some passengers to stand on seats to avoid becoming wet.

Photographs taken at the time show solid water coming over the bow. Some at least of this was entering the void spaces through the ventilators in the house sides. The engine flywheel began to throw up water, the level of the water in the engine room being up to the engine plates. The engineer reported the matter to the master with the suggestion that the vessel should return to Circular Quay. The master continued the dash to the finishing line, brought the ferry to a stop, and changed ends. The vessel then proceeded to Circular Quay where two emergency pumps were used to assist the ship's pumps to try and remove the water. All the passengers and crew and catering staff were able to go ashore without hazard. An MSB tug with a pump was despatched to assist, but arrived too late to be of help. About an hour after returning to the Quay the trim changed from a trim by the stern to a trim by the head. The vessel had then lost longitudinal stability and foundered by the head.

CONDITION OF THE VESSEL AFTER SALVAGE

Inspection of the vessel after salvage revealed damage from two separate sources.

- damage caused during salvage; and
- damage which was existing at the time of foundering.

The vessel was lifted by floating crane using lifting slings round the hull. No spreaders were used in way of the deck or cabin top. As a consequence, the cabin top was crushed and the cabin displaced to starboard.

At deck level the sponsons and sheer log had been displaced upward and twisted inboard, causing planking below the sheer log to spring apart and open up. There were several smaller items of damage caused during the lift. This damage and other defects were observed during inspections of the vessel by the Court. The rim and sponson band at the bow were deflected inboard in a V shape, evidence of a heavy blow in this area. It was suggested that this damage had occurred after the refit was completed; however photographic evidence was produced which clearly showed that this damage had existed prior to the refit and had not been repaired then. This impact would have sprung planking in the forward area of the counter. This would have loosened caulking and caused springing in the forward end planks.

The caulking in the topsides was in generally poor condition and loose or missing. Depending on their standing at the Court of Inquiry, some witnesses attributed all this to the stress in the hull caused by lifting while others were of the view that much of the defective caulking showed evidence of being of long standing. Certainly, between the sponson damage and missing caulking, there was ample opportunity for admission of water at the fore end. With the lack of watertightness of the bulkheads, spread of water between compartments was inevitable.

Examination of the pump suctions indicated that one of the three engine-room strums contained a quantity of foreign matter, while the bars which had been welded across the end of the bilge pipe (instead of fitting a strum) were also partly blocked with rubbish. A considerable reduction in pumping capacity would have resulted because of the blockages. The absence of the bulkhead plugs and

the non-watertightness of the bulkheads would also have contributed to the accumulation and dispersion of flood water throughout the vessel.

BULKHEADS

The five compartments were separated by four timber bulkheads. There was no evidence adduced as to whether these were spaced to provide any standard of sub-division. Whether the influence of *Titanic* in 1912 extended to Sydney Harbour ferries in 1913 is not known.

There was considerable difference of opinion among witnesses as to whether these bulkheads should be watertight. At the foot of each bulkhead on the centreline were intended to be two holes closed by plugs. Normally these would be in place, being removed only for survey and washing down compartments to enable water flow between compartments. In fact, on 22 January 1984, it seems that the only plugs in position were those in the bulkhead separating the forward void space from the engine room. These were not visible due to an accumulation of bilge water and sludge on the engine room planking.

Between the after void space and the engine room was a 'very large hole' which enabled the water inflow into the after compartments to travel to the engine room for removal by pumping. There was some question as to whether the bulkhead boundaries were watertight. The penetrations through the bulkhead were not.

Had the bulkhead between the forepeak and the forward void space been watertight, the inflow of water through the shell planking, the damaged sponson structure and the forward ventilators would have been restricted to the forepeak. While this would have resulted in trim by the head, the foundering may have been avoided or at least delayed.

VENTILATORS

While the 16 ventilators 500 mm long x 150 mm high with 150 mm coamings above the main deck may have been considered appropriate for ventilating coal bunkers, once the vessel became a motor ship an alternative arrangement would have been more appropriate for the safety of the vessel. Cowl ventilators located on the upper deck and trunked through the main deck into the four below-deck spaces they served would have been more effective in providing airflow. Such an arrangement would also have been beneficial in inhibiting the development of rot, which was evident in the vessel, particularly in the after void space. No action had been taken during the refit and survey to remedy this situation, presumably because of the doubt existing between MSB and UTA as to the prime responsibility for action.

PUMPS

After the return to Circular Quay, the main engine pumping system could operate only at reduced efficiency due to the form of strainer used at the after end of the engine room. The strainer system used at the end of the bilge line consisted of bars welded across the mouth of the suction. These bars effectively reduced the area of the pipe by approximately 40%. Any obstruction by debris round the pipe opening would have meant further reduction in pumping capacity. A conventional strum would have had a significant effect on pump flow. Though it did not influence the sinking, the over-side discharges were not fitted with the required valves.

STABILITY

By the time that *Karrabee* came to a stop just beyond the Harbour Bridge, the condition of the flooded vessel was such that it was considered that in another ten minutes the vessel would have been immobilised and in a further ten minutes the vessel would have capsized. Once the master had been informed of the state of the water in the vessel, it would appear that he did not appreciate the situation fully and take steps to improve his stability by moving all passengers from the upper deck to the main deck. Had the master requested another ferry to come alongside to take off his passengers, the esti-

mated range of positive stability was such that unless the transfer of passengers was tightly controlled, the vessel would have capsized.

On the other hand, if the master had turned the vessel rather than reversing direction and returning to Circular Quay propeller end first, the heel due to rudder effect could well have been enough to prejudice the safety of the vessel, with the distinct possibility of capsize. Had the distance to Circular Quay been greater, it is questionable whether the vessel would have foundered before she capsized, since both longitudinal and transverse stability had been greatly reduced.

OTHER RELEVANT ISSUES

The above brief summary is intended to cover only issues as they relate to the vessel. The Court was invited to, and did, address a number of other issues relevant to the sinking in its report handed down on 4 December 1984[1].

These included:

- MSB Survey practices;
- UTA operating procedures;
- MSB/UTA interrelation;
- The education, training and certification of ferry masters, engineers and crews;
- The operation of 'high technology' ferries;
- Emergency procedures, including the Counter Marine Disaster Plan for Sydney Harbour and Botany Bay (known as MARDAP); and
- Communications.

REFERENCE

1. Inquiry into the Circumstances Surrounding the Sinking of the Sydney Harbour ferry *Karrabee* at No.4 Jetty, Circular Quay, Port of Sydney on 22 January 1984. Decision of Court, 4 December 1984.

FROM THE ARCHIVES

Following the theme of Bob Herd's article in his series on Forensic Naval Architecture, this photograph from the archives shows the Sydney ferry *Karrabee* afloat again with the help of the 150 ton-lift floating crane *Titan*. *Karrabee* survives as a floating restaurant on the NSW Central Coast, but *Titan* met her end on Christmas Day 1992 when she capsized off Smoky Cape on the NSW coast while being towed to Singapore. The upturned pontoon subsequently sank on 29 December 1992 near Camden Head. Perhaps we might tell the story of her loss in more detail in a future *ANA*.
(Photo John Jeremy collection)

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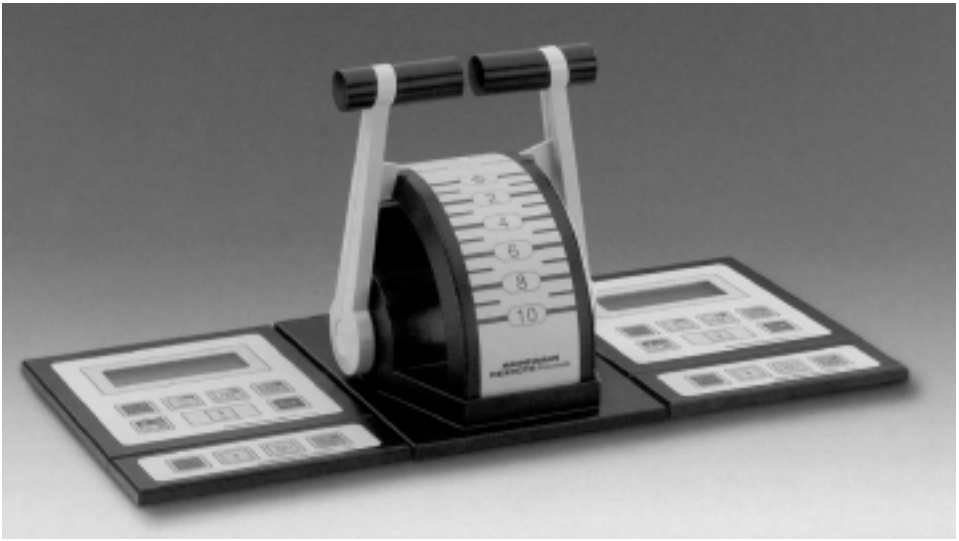

MAREX OS in any case....
the remote control with CAN bus

The concept

- Open, modular system configuration
- Can be used in any marine propulsion system
- Intelligent and compact basic components
- Control heads with lever follow up

The technology

- Microprocessor based control processing
- Data transfer via CAN bus
- Clear text information via display
- Serial interfaces to external systems

The advantages

- Safe and comfortable manoeuvring
- Minimises design and installation costs
- Simplified display adjustment for commissioning
- Reduced service costs using telediagnosis

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