THE AUSTRALIAN NAVAL ARCHITECT

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THE AUSTRALIAN NAVAL ARCHITECT

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Cover Photo:
The RAN's first wavepiercing catamaran, HMAS *Jervis Bay* alongside the replenishment ship HMAS *Success* at anchor off Dili, East Timor (RAN Photograph).

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RINA Australian Division
on the
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FROM THE DIVISION PRESIDENT

At the last Division Council meeting the position of President of the Australian Division was discussed and resolved with a new President being appointed to complete the current term of office. This came about because Mr Bryan Chapman believed that he could no longer adequately perform the duties of President due to overseas business commitments. The immediate past Vice-president, Mr John Colquhoun, has been appointed to the position of President and Mr Chapman is appointed as Vice-president.

To those of you who don't know me, I reside in Canberra and am currently the Mine Hunter Coastal Platform [i.e. Ship – Ed.] Systems Engineering Manager for the Department of Defence. I have worked in Defence for the past nineteen years and have been a member of RINA at one level or another since 1985.

As you would all know, a number of important issues are currently being considered by the Division Council, including the formalisation of our position with regard to IEAust and the awarding of prizes in Australia. These activities will be continuing and will be reported to the members as and when necessary either through the ANA or at local meetings. Members are reminded that they all have a direct line to Division Council meetings through their local committees who each have a member representative on the Division Council.

Members may be pleased to note that the Division Council has recently received word from London that additional funding of 30% has been approved for the Australian Division with effect from 1 July 1999. In addition recent correspondence from the Chief Executive put forward the proposal that a joint Australian and New Zealand Division be formed. This proposal was further discussed with the Chief Executive during his visit last month particularly with regard to additional funds being made available to cover the costs of running such a Division. The proposal will be further discussed at the next Council meeting on 10 December.

In closing I would like to remind members that they will get out of RINA only what they are prepared to put in, so you should all consider going along to local technical meetings whenever possible. Additionally all members should promote RINA amongst their peers and recommend membership where this is appropriate.

John Colquhoun

FROM THE CHIEF EXECUTIVE

May I take this opportunity to thank all those members of the Division who helped to organise my recent visit to the Division and who once again made me feel so welcome.

I recently wrote in RINA Affairs (which I am sure is read as avidly as the *ANA*) that if the Institution is to succeed as a modern international professional institution, responsive to the changing needs of its members, it must seek their views to find out what those needs are. In this shrinking world of faxes and emails, I believe that there is still no substitute for that personal contact which I gain from meeting and talking to members.

I came away with a number of suggestions which I will take up where possible, and the firm impression of a Division in good heart. The formation of a new Section in Queensland and the efforts to increase the number of members was evidence of this.

I was able to update members on recent and planned developments such as making all Transactions papers freely available to members (all Transactions papers can now be downloaded from the RINA Website). I hope I was able to convince those who needed convincing that the RINA of today is an international professional institution which just happens to have its headquarters in London, reflecting the global nature of the maritime industry.

I also reported that the Institution continues to give emphasis to meeting the needs of its younger members. In that context, it was a particular pleasure to meet up with the students at UNSW and the AMC. It was also a pleasure to present the first Australian RINA-Marconi Marine Student Naval Architect Award (of A$500) for the best presentation of a final year project to Michael Andrewatha at UNSW. I hope that Student and Graduate Members in the Division will play a full part in the new Internet-based Young Members Group.

My congratulations to the new President of the Division on his election. I look forward to meeting him at his first RINA Council meeting in London. The Council has agreed that he may be represented by any member of the Division Council, and invite any member of the Division Council who might be in UK at the time to attend Council meetings. And of course, I still live in hope of seeing an Australian member elected to the RINA Council in his, or her, own right!

Once again, my thanks to all those members who made my visit so enjoyable and, for me at least, worthwhile. I look forward to Sea Australia 2000 which promises to be a very successful conference.

Trevor Blakeley

EDITORIAL

In the corporate world, it is well known that the best time to issue a press release containing bad news that just has to be made public is late on Friday night. The specialist reporters have probably gone home for the weekend, and it is too late for the Saturday papers. Over the weekend the public is more interested in sport than more serious pursuits, and by Monday the bad news will have been overlooked.

Surely it is a coincidence that the Defence press release DPAO 328/99 hit the email at 2010 on Friday 29 October 1999. It had a positive header — *Defence to upgrade the ANZAC fleet's anti-ship missile defence capabilities* — but the news was essentially bad. It had been decided that the Warfighting Improvement Programme for the ANZAC frigates *was not achievable within acceptable costs and risks…* (see the report on page 11).

Perhaps the capabilities sought for the class were too ambitious. They were originally intended to fulfil a reasonably modest role in the RAN, and not to be replacements for the guided missile destroyers now going out of service. They were not intended to be front-line warships in the same sense. We should not be too quick to criticise the selected MEKO 200 design or those who made the choice back in 1989. There are, however, important lessons to be learned (or, more correctly, relearned) from this situation.

For some time it has been fashionable to regard ships as merely platforms upon which the important equipment, the combat system is mounted. This is a dangerous fashion, for it ignores the fact that the warship is, as a whole, the combat system, and the ship that cannot support and operate its payload in all necessary environments is a failure. The warship must be designed as a fully integrated system, and that includes the provision of space, weight, power and services margin to enable the payload to be changed from time to time throughout the hull life. We all know how fast modern technology is changing, and we can expect several (perhaps even four or five) generations of technology to come and go in the thirty years or so that we expect our warships to last.

There are those who will point out, quite correctly, that the cost of the hull and its systems is the least cost of a warship acquisition, and we should be prepared to throw them out when the payload technology expires. Realistically, the parliament and the public see things rather differently, a habit not confined to Australia. It is easier to get approval to buy a new combat system for an old ship than a new ship each time the computer needs to be replaced.

The lesson is always to buy a larger and more capable ship than is needed at the outset to support the initial payload. This does not mean adopting a 'fit for but not with' philosophy, which is now widely regarded as a false economy, but providing a wide margin for future growth, and plenty of space to permit upgrades of the payload to be carried out without major ship surgery and the consequent eye-watering cost. As an example, just look at the US Navy DD 963 destroyer design, and its evolution to the Kidd class DDG and finally the Ticonderoga class (CG 47) Aegis cruiser. They all have the same basic hull and machinery, designed in the late 1960s, yet over the twenty-year production programme, the combat system capability was vastly improved.

A big adaptable hull presents far fewer problems for progressive payload upgrade during a multiple-ship construction programme. It also has the enormous side benefit of producing a commodious and comfortable hull that can accommodate crews with changing expectations throughout the life of the ship, and moreover one that is more easily maintained. And, in the Australian context, can successfully operate in our huge area of maritime responsibility from northern tropical waters to the southern ocean.

By all means we should provide the RAN with patrol ships and other small vessels where their use is appropriate, for example in the role now undertaken by the Fremantle class patrol boats. But for offshore work with high-value combat systems we should buy the largest and most accommodating hulls we can possibly afford. The challenge for defence planners, naval architects and shipbuilders is to convince the politicians that the hull is cheap, the benefits are great, and it is definitely not an exercise in building platforms for admirals.

John Jeremy

NEWS FROM THE SECTIONS

Queensland

The Queensland Section met on two occasions during the last quarter. The first was the quarterly section committee meeting (followed by a technical meeting) held on 7 September at the Southport Campus of the Gold Coast Institute of TAFE. The second gathering was in Brisbane at the Yeronga Institute of TAFE to meet with Trevor Blakeley, the RINA Chief Executive from London. Both the technical meeting and the meeting with Trevor Blakeley were well attended by our younger members which was most gratifying.

At the section committee meeting the committee endorsed the concept of and agreed in principle with the development of an Advanced Diploma of Engineering (Naval Architecture) in the Brisbane area. Together with local support, Trevor Blakley subsequently offered support from London if necessary to get the diploma up and running.

The technical meeting consisted of the presentation of a technical paper titled *Offshore RO-RO Passenger Catamarans.* Initially this paper was to be presented by Stuart Ballantyne but Stuart was called away overseas unexpectedly so Dion Alston ably made the presentation.

The visit of Trevor Blakeley to Brisbane on 5 October proved most successful. Brian Hutchison kindly took time out from his busy work schedule to show Trevor and his wife the sights of Brisbane. During the evening an informal meeting was held at Yeronga Institute of TAFE to introduce Trevor to section members and to discuss a range of subjects affecting the Australian Division and Queensland Section. These subjects included payment of subscriptions, allocation of funds to the sections and student membership.

My own discussions with Trevor revealed that, at long last, the Institution has recognised the fact that it is an international Institution rather than just a UK-based institution. This can only help with the long-term survival of the Institution. Also it was noted that there is now a much closer association between RINA and SNAME as well as with the IEAust. I certainly came away with the impression that the RINA Council in London has become more outward looking and headquarters has modernised its organisation and enhanced its services to members, particularly to those outside the UK.

Brian Robson

Western Australia

Since the last report the Western Australian section has held one technical meeting and, on a separate occasion, met with the RINA Chief Executive Trevor Blakeley.

The technical meeting was a joint meeting with the Institution of Marine Engineers, held on the 10 August. The presentation was titled *The Jervoise Bay infrastructure development project – Facilities for large marine module fabrication and load-out.* It was presented by Mr Denis Picket, the Senior Project Officer for the Jervoise Bay Project. This project involves the development of a Marine Industry Technology Park in Jervoise Bay, to allow Western Australia to take advantage of a predicted $20 billion worth of resource projects likely to occur over the next ten years. An $80 million Federal grant has be given to support the the Western Australian Government development. Three consortia have been short-listed to tender for the project, and it is expected that the successful one will be appointed by April 2000. The facility is anticipated to be fully operational by July 2002. The main features of the development include:

- 12 metre deep approach channel and harbour basin;
- 350 metre berth for the fit-out and refit of large marine structures;
- 60 ha common-user module assembly and load-out area; and
- 80 ha industrial estate with heavy load road access to the waterfront.

Further information on the project can be obtained from the website: `www.commerce.wa.gov.au/business/jervoise/jervoifr.htm`

Geoff Leggatt

Canberra

A joint IEAust MARENSA/IMarE/RINA workshop dealing with patterns of procurement of defence capital equipment and effects on defence and industry preparedness was held at IEAust's Engineering House on 26 September. Key speakers were RADM Bill Rourke (Ret) and RADM Nick Hammond (Ret) while the debate was summed up by Paul Earnshaw. The speakers described procurement approaches that they considered would better suit both defence and industry than those adopted in recent years. They considered it to be important to be innovative in design, and to have a substantial and well-exercised capability to respond to changing needs. They also argued for the need to identify rapidly-developing technologies, and planning to be able to develop capabilities as the pro-

curement progresses. It was also argued that a greater input should be sought from Industry in the defence decision-making process and the development of requirements.

The joint annual dinner of the Canberra sections of RINA and IMarE was held at the Embassy Motel on the evening of 22 October. Our guest speaker, Phil Barnaart, provided a professional and entertaining after-dinner presentation of his experience with the Australian National Antarctic Research Expedition (ANARE). Phil is currently employed with the Australian Customs Service but had previously lead a number of winter seasons at Australian bases in mainland Antarctica as well as Macquarie Island, his personal favourite. He talked the group through a slide show describing the wildlife, landscape, ships and equipment as well as the lifestyle with which he has become familiar.

On Tuesday 16 November, Greg Hellessey of the Australian Customs Service has arranged with IEAust to give an update on the production and introduction into service of the new Bay Class Patrol Boats for local members of IEAust, IMarE and RINA. This presentation may be made in association with a representative from Austal Ships who are currently building these boats.

On 2 December, naval architect Bruce McNeice of the Department of Defence will give a presentation on the conduct of shock trials on the RAN's Mine Hunter Coastal. On secondment to ADI from the Defence Department, Bruce was involved in the preparation and conduct of these trials.

As a result of a brain fade of the section secretary, the Canberra section news in the last issue of the *ANA* failed to note that John Colquhoun and Laurie Mayer remain on the section committee. Since then however, Lawrie has sought out a tropical paradise and relocated to an AMSA position in Mackay!

Martin Grimm
Adrian Woodhouse

Victoria

Joint meetings with the Institute of Marine Engineers continue to be held on the third Tuesday of the month.

On 17 August Doug Bews gave an illustrated paper on the *Construction of the Collins Class Submarines*, including the Sub-safe and Quality Control philosophies and techniques, and the extensive tests and trials programme.

Doug, who has an extensive background in submarines, was Production Director of the Australian Submarine Corporation from December 1993 to December 1998, and is currently engaged at Tenix Defence Systems at Williamstown in the ANZAC Frigate programme.

On 21 September Bob Herd (Principal of R J Herd and Associates Pty Ltd., Consulting Naval Architects) presented a paper *Politics and Ship Design, The Loss of HMS* Captain*, the Story of a Little Known Naval Disaster*. HMS *Captain* capsized off Cape Finisterre early on the morning of 7 September 1870 with the loss of some 480 lives, including her captain, designer and the midshipman son of the First Lord of the Admiralty. There were 18 survivors. The First Lord had some time previously been a stevedore in the Port of Melbourne. Naval architects familiar with the development of stability concepts will no doubt have heard of the contrast between *Captain* and *Monarch*.

On 13 and 14 October the section entertained our Chief Executive Trevor Blakeley and Mrs Blakeley on their visit to Melbourne. Visits were paid to the museum ships *Castlemaine* and *Polly Woodside*, and the ANZAC Frigates under construction at Tenix Defence Systems were inspected. The visit concluded with an enjoyable dinner on the evening of the 14 October, enjoyed by some 24 members and partners. Trevor addressed those present and subsequently was able to enjoy individual discussions and respond to questions.

On 19 October the Victoria-Tasmania Branch of the Institute held its annual meeting following which members of both organisations were informed and entertained to an evening of miscellany in which three members reminisced on significant engineering experiences. Mike Hines of Shell Australia outlined an experience with the repair of a damaged thrust block in a Shell tanker berthed in Philadelphia. Graham White, formerly with ASP Ship Management, outlined the early problems with a tailshaft in a newly-completed 17,000 ton container ship built on the NE Coast of England some years ago for another company. Howard Mumford, of ASP Ship Management, discussed the practical difficulties associated with repairing a badly damaged propeller and rudder following the grounding of a bulk carrier. In view of the time needed for manufacture of replacements, repair with all its difficulties, was necessary to minimise time out of service.

Bob Herd

New South Wales

The NSW Section Committee met on 23 September and discussed the timing and venue for the annual dinner combined with the IMarE (Sydney Branch), meeting attendances and name tags, advertising in the *ANA*, sponsorship of meetings, the outline of a technical programme for 2000, the venue for 2000 techni-

cal meetings, upgrading of membership status, and the Fisher maritime course.

The NSW Section Committee also met with Trevor Blakeley on the afternoon of 7 October during his recent visit to Australia. Items of mutual interest were discussed, and Mr Blakeley was given an outline of the initiatives taken by the NSW Section in its inaugural year of operation. The committee then enjoyed dinner with Mr Blakeley at a local Thai restaurant.

The inaugural annual dinner of RINA (NSW Section) with the Institute of Marine Engineers (Sydney Branch) was held on the evening of Saturday 6 November at the Sydney Flying Squadron at Careening Cove. Thirty-six members and partners thoroughly enjoyed the waterfront venue and an evening which featured informality (i.e. no speeches), light-hearted banter and lively conversations, before, during and after dinner. A measure of the success of the evening was that the staff were all packed up and waiting for us to go at midnight.

Kevin Gaylor of the Maritime Platforms Division [that should be Ships Division! — Ed.] of the Defence Science and Technology Organisation gave a presentation on *The Design of Smart Ships for the RAN* to a joint meeting with the IMarE attended by thirty-nine on 25 August at the Portside Centre.

There are a number of drivers, both technological and sociological, which will influence the way future warships are designed and operated. These include the push for reduced crew levels, increasing use of commercial off-the-shelf equipment, the requirement for adaptability of warship functions, and the need to reduce whole-life costs of the ship. Crew costs are significant, and even small reductions in crew size can lead to significant savings. Smart ships will have the minimum manning level consistent with the ship's mission, human performance and safety requirements, affordability, and risk constraints which can be achieved by any combination of automation, task simplification, workload levelling and reduction, function elimination, and function consolidation.

Examination of the way overseas navies are planning for their future warships and how they are currently modifying existing systems can give us insight into how optimised minimum manning can be achieved. The USN, for example, initiated a smart ship trial for a five-month deployment on USS *Yorktown* (CG48, a Ticonderoga class cruiser). The USN changed the policy and procedures, maintenance methods and the technology on board, and concluded that they could reduce the ship's complement by about 15%. They liked the results of the trials and are introducing the principles on existing ships USS *Rushmore* (LPD), seven more LPDs by 2003, Destroyer Squadron 18, and on new constructions of the amphibious assault ship (LPD17), aircraft carrier (CVX) and the destroyer DD21 class.

In his presentation Kevin outlined the DSTO's research and development programme for delivering the requirements of the Australian Defence Forces. Some of the areas include virtual reality and applications to combat systems and control, smart control systems moving from diagnostic (what's wrong) to prognostic (what to do about it), decision support systems, advanced control systems, intelligent crane systems, and Australia's ability in reducing radar cross-sections. He left the audience with excited thoughts of what is possible, but sober thoughts about the consequences of complete power failure! Ray Toman of the University of New South Wales, Jennifer Knox of Lightning Naval Architects, and Ruben Spyker of the AMECRC, Sydney, gave a presentation on *Alternative Fast ferries for Bass Strait* to a joint meeting with the IMarE attended by fifty-two on 22 September at the Portside Centre.

Ray Toman opened the batting and gave a presentation on the economics of the operation and the possible operating ports at both ends. In less than three years there has been a dramatic increase in the number of passenger vehicles (95%) and the number of passengers (58%) being carried across Bass Strait by sea. TT Line estimate that it will carry an additional 12,000 passenger vehicles and 27,000 passengers by the end of this financial year over the previous year. The AMECRC has been commissioned to study the Bass Strait service and propose a number of suitable high-speed ferry concept designs. These included a baseline catamaran and a semi-SWATH vessel from Crowther multihulls, two steel monohull variants from Lightning Naval Architecture, a mono/tri-hull from the AMECRC and an enlarged ship which also has the capability of carrying heavier freight at a slower speed developed jointly by the AMECRC and Lightning Naval Architecture.

An industry workshop on the project was held on 9 July 1999 at the University of New South Wales. Participants included Australian ship owners, fast ship designers and builders, the Bureau of Meteorology, a representative of Tasmanian business interests, classification societies, AMSA and some leading academics in the field (see report in the *ANA*, August 1999). The conference gave encouraging feedback on the work undertaken, and positive ideas for going forward.

Jennifer Knox presented the details of the monohull proposal, which has a length WL of 160 m, beam 16 m and carries 1,000 passengers. The vessel is pow-

ered by a CoDaG arrangement or gas turbines of 54 MW driving 4.8 m diameter propellers or 3.6 m diameter waterjets to give a service speed of 40 kn. She also referred extensively to the wave conditions and the aspects of her design which deal with them; i.e. the slender displacement hull and a pitch-reduction bulb.

A presentation made jointly by Jennifer and Reuben Spyker was devoted to the so-called "enlarged ship" concept; "enlarged" because the vessel is larger than required to carry the passengers. The vessel's length WL was set at 215 m, the limit for turning at Georgetown, and can carry 1,500 passengers and up to 530 cars. Provision would also be made for up to 700 lane-metres of trailers. The service speed would be 35 knots, requiring an installed power of 30 MW. The larger size means that seakeeping is improved and power is reduced.

Ruben Spyker then explained the philosophy behind the trimaran variant. This vessel is a slender monohull fitted with low-displacement side hulls or outriggers which provide additional stability with a low wavemaking resistance. The trimaran is very attractive from the point of view of the layout of the decks, which permits a good flow of vehicular traffic. This vessel has a length WL of 120 m, a main hull beam of 15 m, and requires 40 MW for a 40 kn speed using waterjets. The hull shape was optimised using the ShipFlow CFD package at the Australian Maritime College.

Mr Jonathan Binns of Murray Burns and Dovell gave a presentation on *An Overview of the Technology Potential from the America's Cup* to a joint meeting with the IMarE attended by fifty-nine on 27 October at the Portside Centre.

Jonathan's presentation was timely, as the match races for the Louis Vuitton Cup were already under way at the time, and the match races for the America's Cup will start in mid February 2000 (see *America's Cup 2000* elsewhere in this issue). The rules for International America's Cup Class (IACC) yachts have led the main protagonists to settle on dimensions around a length WL of 20 m, beam WL 3.9 m, displacement 25 t, sail area 330 m^2 and initial righting moment (RMC) of 1390 kgf-m. A comparison of parameters with typical ocean racing yachts shows the following:

Ratio	**IACC**	**OR**
L/B	5.4	3.3–3.7
$L/\tilde{N}^{1/3}$	7	5.9-6.1
$SA/\tilde{N}^{2/3}$	16	10
q_R	180°	120–130°

where SA is the sail area in m^2 and q_R is the range of positive stability.

The construction of IACC yachts is generally sandwich, with 2 mm carbon fibre skins over a 30 mm Nomex core. The keel is high-grade stainless steel, with a bulb of lead and wings of aluminium or composites. However, what really distinguishes the IACC yachts from ocean racing yachts is the *distribution* of mass: of the 25 t displacement, there is 2 t in the hull and structure, 1 t in the rigging, 2 t in the keel, and a massive 19 t in the bulb! This means that the CG of the yacht is just above the top of the bulb, or 2 m below the waterline, where the CG of a typical ocean racing yacht is close to the waterline.

Some of the technology is transportable to other yachts; some is peculiar to the America's Cup. For example, Kevlar aramid fibre sail materials were developed for the America's Cup yachts, and now about 50% of racing yachts use these sails.

Carbon-fibre masts were also developed here, and use either a one-piece or two-piece method. The one-piece method, although more complex, is now widely used.

Mast sections are a development area, and masts now typically measure 1 m fore and aft to give more sail area downwind. The rules do not allow the mast to rotate, but these wing-masts rotate due to twist and give additional (free) sail area.

The loads in the rigging are high to flatten the sails. The mast is first jacked up to give an initial compression of 15 tf (150 kN). Then the runners are pulled on to a tension of 15 tf. The mainsheet typically carries a load of 6 tf, and the genoa sheet 3 tf. With these pretensioning loads, *One Australia* and *Young America* bent like bananas!

Another development area is in pre-tensioning bulkheads with carbon fibre unidirectional reinforcement. The pre-tension is applied before the resin sets, and this helps with the absorption of rigging loads.

Advances have been made in deck hardware, and around 60% of the mass is now saved by using carbon-fibre winch drums, shafts, and pedestals, titanium block cheeks and titanium tangs for take-off points.

Wind-tunnel testing is widely used for IACC yachts, despite its high cost, as it gives designers information which they can't get anywhere else. This includes flow visualisation, and minimisation of resistance due to the bulb-keel and keel-hull interactions. A particular advantage of the wind tunnel is that the Reynold's number is approximately correct, which does not happen in a towing tank.

Phil Helmore

Sea Australia 2000

This conference will be held in Sydney from Tuesday 1 to Thursday 3 February 2000, in conjunction with the Pacific 2000 Exhibition. Organised by RINA, IMarE, IEAust and the AMECRC, the Sea Australia 2000 Conference will cover a wide range of topics relevant to the new millennium, including innovations in marine design, novel proposals for propulsion, trends in port handling facilities, developments in offshore industries, safety regulation and the marine environment. Further information can be obtained in the article elsewhere in this issue, or from the conference secretariat, Ms Anne Lewis at ICMS Ltd, phone (02) 9976 3245, fax 9976 3774 or email seaaust2000@icms.com.au.

STAB2000

The Seventh International Conference on Stability of Ships and Ocean Vehicles will be held in Launceston from Monday 7 to Friday 11 February 2000. Organised by the AMECRC, AMC, UNSW, AMSA and RINA, this conference will promote a full exchange of ideas and methodologies on the stability of ships and ocean vehicles of all types. Topics include updates to IMO, USL Code and RAN stability criteria, damaged stability of ro-ro vessels, stability of high-speed craft, model testing and correlation, computer techniques, stability of offshore engineering structures, design aspects, and the human/vehicle interface. Further information can be obtained in the article elsewhere in this issue, or from the conference secretariat at the AMECRC Launceston, phone (03) 6335 4885, fax 6326 6261, email stab2000@crc.amc.edu.au or web-site www.amc.edu.au.

Workshop on Yacht Performance Prediction

The Australian Maritime College is organising a workshop on Yacht Performance Prediction to be held at the College on Monday 13 and Tuesday 14 February 2000, immediately following STAB2000.

This workshop will have experts from industry and academia giving presentations on the important design differences between sailing yachts and other water craft, the prediction problem, and stability and capsizing. A realistic yacht design brief will be used for attendees to work through the performance prediction process. Demonstrations of the towing tank and the cavitation tunnel will be used and their application to yacht performance prediction discussed.

Further information may be obtained from Mr Kim Klaka, phone (08) 9266 7543, fax 9266 2377 or e-mail k.klaka@cmst.curtin.edu.au, or from the AMC website www.amc.edu.au.

IMarE Conference 2001

The Australia/New Zealand Division of IMarE will host an international maritime conference at the Wellington Convention Bureau, Wellington, New Zealand, from Monday 19 to Wednesday 21 November 2001.

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!

Futher information may be obtained from Mr Barry Coupland, phone +64-4-382 9666, fax 382 6303 or email barry.coupland@marine.co.nz.

COLLINS CLASS UPDATE

In the second of a series of regular updates on progress with the Collins class submarine project, on 3 September Rear Admiral Peter Briggs, Head of the Submarine Capability Team, said that activities since his previous briefing on 23 July had focussed on changes to the engine, noise signature and submarine casing, and combat system.

"We're seeing an improvement in reliability of the engines as the combined change of fuel filter modifications and operating procedures start to take effect," he said.

"Modelling of the engine by the Defence Science and Technology Organisation (DSTO) has produced a revised running speed which has been successfully trialed in one boat and led to modification of the other two currently in service, HMA Submarines *Farncomb* and *Waller*. However further trials are required and we're not 'out of the woods' yet."

In terms of improving the process of bringing the new submarines on line, RADM Briggs said that his team had identified issues necessary to fast track HMA Submarines *Dechaineux* and *Sheean* (Boats 4 and 5 in the Collins class production programme).

"The augmentation of the combat system is proceeding to plan and a US Navy-sourced system will be installed in *Collins* for early trials, to maintain the fast-track momentum," he said. "And, in the longer term, we are considering options for replacing the original combat system."

Admiral Briggs said trials of the changes to the submarine casing — expected to reduce the submarines' noise signature — are underway in the first of class, HMAS *Collins*.

"The results are not in yet, but we expect these, together with changes to the fin and to the propeller, to produce a significant reduction in the noise signature of the new boats, based on tank testing at DSTO and in the United States," he said.

RADM Briggs described noise signature rectification work in submarines to be an 'evolving process'.

"We will reach a point where the noise signature is acceptable for the current operational situation," he said, "but we are unlikely ever to close the books on trying to improve it."

RADM Briggs believes that the fast-track target of two submarines operational by December next year is achievable.

"It will take a major effort from all concerned," he warned. "The longer-term fixes require refit work to submarines and options will be included in the recommendations to Government in the September 30 Report. A timetable to achieve this position will depend upon which of the recommended solutions are accepted by Government".

RADM Briggs said submarine manning was a high priority with a number of initiatives being implemented including an RAN trials crew formation, establishing shore positions for shore relief and changing from a two-to-three watch regime to address the heavy workloads of the Collins class crews.

He said that increased recruiting and an intensive training regime, including a greater use of simulators, was required to achieve the correct number of qualified submarine personnel needed to crew the submarines to meet future capability requirements.

In mid-October HMAS *Collins* began a main battery exchange at the Australian Submarine Corporation's yard in Adelaide. The submarine docked on 19 October for the battery change and other work that is expected to take fifteen weeks to complete.

Collins will then undergo abbreviated maintenance for approximately two weeks in Western Australia before re-entering service.

WHITHER THE WIP?

Defence Project SEA 1443, the ANZAC Frigate Warfighting Improvement Programme, proceeded through Concept and Definition Studies (completed in February 1998) with the aim of improving the anti-ship missile self-defence and long-range air-warfare capabilities of all of the ANZAC frigates.

The first two ships, *Anzac* and *Arunta* are in service, with six more ships under construction for the RAN. Proposals for Project Definition Studies (PDS) were

received from British Aerospace Australia, ADI Limited and Tenix in December 1998. The PDS were to provide information on the cost of updating four or eight ships to three levels of capability.

Capability Level 1 included improved anti-ship missile defence suited to the missile threat expected in the first part of the next century, as well as close-in defence against attacking aircraft.

Capability Level 2 built on Level 1 and included an air warfare capability with the addition of the SM-2 missile, Link 16 inter-ship/aircraft data communications, two additional vertical launch system modules and an upgrade path to a cooperative engagement capability.

Capability Level 3 built on Level 2 and included a cooperative engagement capability, infrared search and track, electronic attack, an on-board training system and a growth path to theatre ballistic missile defence.

On 29 October 1999 the Department of Defence issued a press release which stated:

"The Department of Defence has recommended to proceed at this stage with a modified upgrade to the ANZAC Frigates' anti-ship missile defence, and to investigate alternative options for providing a long-range air-warfare capability.

Defence has been investigating an upgrade to the ANZAC Frigates with industry since 1996. The original concept for this upgrade included improvements to their anti-ship missile defensive capabilities and the addition of a long-range air-warfare capability.

As the Department and industry continued to study the proposed upgrade, it became clear that the proposed upgrade was not achievable within acceptable costs and risks for the capability improvements sought.

The ANZAC anti-ship missile defensive upgrade will be designed to provide a practical level of self protection against anti-ship missiles, allowing them to operate in medium threat environments and employ their surface warfare capabilities.

The pending retirement of the Perth class guided missile destroyers (DDGs) will reduce the Navy's air warfare capability. The Department of Defence, with assistance from industry, will examine options for providing an appropriate level of this capability in the surface fleet.

The Government is committed to maintaining a highly effective surface fleet and recognises that close collaboration with industry is vital to achieving this aim."

FFG UPGRADE

The FFG Upgrade Project to be carried out by Australian Defence Industries (ADI) was outlined in the *ANA* in February 1999. The project is primarily a weapons and sensors upgrade valued at almost $1 billion dollars and will result in the six FFGs having their capability to defend themselves significantly increased.

The ADI Contract for the FFG Upgrade Project was signed on 1 June 1999, with the major subcontractors, Lockheed Martin and Gibbs & Cox Inc. being signed up shortly after.

From a platform (i.e. ship) perspective, the major impact of the upgrade is an increase in displacement due to additional equipment being fitted and the corresponding effects on the platform systems such as cooling water, electrical power, air conditioning, ventilation, firemain and compressed air.

The addition of the upgrade equipment items will result in a net increase in displacement. This increase consists of the weight of the equipment fitted and the ballast required to correct the trim, primarily due to the new vertical launcher being fitted on the foredeck and to keep the KG below the limiting KG value. The effect of the added weight is that the current limiting displacement of the ship will be need to be increased.

The increase in the limiting displacement will be analysed with regard to structural strength (intact and flooded), stability (intact and damaged), speed, range and manoeuvrability.

John Benjamin

AUSTAL SHIPS DELIVERIES

The 52 metre high-speed passenger catamaran *Betico* has been delivered by Austal Ships to the Provincial Government of the Loyalty Islands of New Caledonia. The ship will provide an essential link to the capital Noursubmarinesmea.

Seakeeping was extremely important to the owners and was a major consideration in the vessel's design, ensuring a smooth operation in calm to rough sea conditions where the vessel will encounter south-east prevailing winds all year round. In response to this, and in addition to Austal's well-proven round-bilge and bulbous-bow hullform, the aluminium catamaran features a middle bow which only comes into effect in seas greater than 2 metres. To enhance passenger com-

fort, *Betico* is also fitted with the Austal "Ocean Leveller" ride control system, this time with keel-mounted foils to help minimise the danger of hitting whales that frequent the vessel's area of operation.

Powered by quadruple MTU 12V engines, (selected over the 16V engines as the best compromise between speed and fuel consumption), *Betico* comfortably achieved a fully-loaded speed of 34.5 kn during sea trials. The vessel is scheduled to commence service in November 1999 and will operate all year round. With its home base in Noumea, the 52 m catamaran will provide tourists and locals with daily return services to the Loyalty Islands.

Betico is comfortably appointed throughout and features three distinct passenger classes. A total of 366 passengers are accommodated in fully air-conditioned saloons and television units are provided in all seating areas. The main deck seating for 256 passengers is divided into forward and aft saloons, separated by a comprehensively-equipped central kiosk, toilet facilities and baggage storage area. Seating features a combination of airline-style seating and table-and-chair arrangements with fold-down trays fitted to each seat. Amtico flooring in varying colours is featured throughout.

A single stairwell located amidships on the main deck leads to the Business and VIP areas which are separated by doorways located on the port and starboard sides of the vessel. A fully-equipped kiosk is located aft on the upper deck and can be easily accessed by passengers seated in both saloons. Seating for 90 passengers in the business-class area forms a combination of airline-style seating and table-and-chair arrangements with the airline-style seats being fitted with fold-down trays.

The VIP saloon seats 20 passengers in luxurious reclining chairs arranged in a combination of airline-style seating, table-and-chair arrangements and lounges. Seating areas are fully carpeted with Amtico flooring. The VIP saloon is also equipped with two small coffee machines. External seating in the form of canvas deck chairs is available for 10 passengers on the aft bridge deck.

The wheelhouse is designed for four-man operation and features external wing stations with waterjet joystick controls for intricate manoeuvering and docking. Main electronics include the MTU MCS-5 monitoring system, two Kelvin Hughes radars (Nucleus 2 5000 Ecdis and Nucleus 2 5000A), Skipper echo sounder, electronic chart navigation, Navtex GMDSS and Leica DGPS Navigator.

The aluminium catamaran is equipped with for four 6 m long inflatable mini-slides. Ten 50-person SOLAS B inflatable liferafts are stationed to port and starboard on the upper deck superstructure. *Betico* is also equipped with a Zodiac inflatable rescue boat (located aft on the main deck) that is launched using a fixed Acebi davit.

The overall length of *Betico* is 52.4 m, with a waterline length of 45.4 m, moulded beam of 13.0 m and hull draft of 1.5 m. The propulsion package comprises four MTU 12V 4000 M70 engines, four Reintjes VU 930 gearboxes and four 63 SH waterjets.

Austal currently has some 13 vessels under construction or on order. Imminent vessel deliveries include one 60 m boutique cruise vessel for Compagnie Chambon of France and one 86 m Auto Express High-speed Vehicle/Passenger catamaran to be delivered to BjornholmsTrafikken of Denmark.

Betico during trials off Fremantle in September 1999 (Photo courtesy Austal Ships)

Austal Ships have delivered two more of the 38 m Bay Class series of patrol boats under construction for the Australian Customs Service National Marine Fleet. The first in the series of eight, *Roebuck Bay* was delivered in February with the latest two, *Holdfast Bay* and *Botany Bay*, following on time in August 1999.

Botany Bay was officially commissioned by the Minister for Finance and Administration, Mr John Fahey MP in Sydney on 16 September and *Holdfast Bay* was officially commissioned by the Minister for Justice and Customs, Senator Amanda Vanstone, in Adelaide in October.

These vessels will form an integral part of the Australian Customs Service fleet of patrol vessels and will complement Customs Coastwatch aircraft which provide a national civil surveillance and response service. The 38 m aluminium hulled patrol boats have a range of 1,000 n. mi. at 20 kn and are capable of operating around Australia's 37,000 kilometre coastline and out to the edge of the 200 nautical mile Exclusive Economic Zone.

The medium speed Bay Class patrol boats (21 kn @ 80% MCR) have the ability to maintain speeds of less than 5 kn for extended periods as required for surveillance operations. The ability to launch one or both of the custom-built tenders fully-loaded in up to Sea State 4 enables the Australian Customs Service to perform a large variety of functions, from intercepting unauthorised vessels, smugglers and illegal immigrants to assisting with scientific and marine research. The tenders can also be launched and recovered safely and effectively while the vessel is making way at up to 5 kn. The Bay Class vessels are capable of operating for up to 28 consecutive days at sea.

The vessels are fitted with a bow thruster to assist with manoeuvring in difficult weather conditions and are capable of moving sideways at a minimum of 20 m/min and turning 360 degrees in their own length within 90 s. Large oversize rudders with quick response are fitted to provide steerage at low speeds.

For roll and pitch control, the Austal active ride control system consisting of rotating cantilevered fins amidships and flaps aft were fitted to optimise crew comfort and vessel performance at higher speeds. The system includes a facility to dynamically trim the vessel from the wheelhouse.

The Bay Class Patrol Boats take their names from bays around the Australian coastline. The next two patrol boats (Hulls 134 and 135) are due for delivery in February 2000 with the remaining three (Hulls 136, 137 and 138) in August 2000.

The patrol boats *Botany Bay* and *Holdfast Bay*, delivered to the Australian Customs Service in August 1999
(Photo courtesy Austal Ships)

The first Australian-built fast ferries to be imported into Norway have been delivered by Austal Ships to Norwegian ferry operator Hardanger Sunnhordlandske Dampskipsselskap (HSD). The two 42 m catamarans were built by Austal Ships to a design jointly developed by HSD, Norwegian marine consultants Paradis Nautica and Austal.

Named *Sleipner* and *Draupner*, the sister ships have since joined HSD's 'Flaggruten' service operating between Bergen and Stavanger. The 120 n. mi. route has a scheduled journey time of 3 h 55 m at a service speed of 34 kn.

During the design a significant effort to reduce on-board noise levels included noise pulse measurements from cavitation tunnel testing of the propellers and a detailed noise vibration study undertaken by DNV. Resultant noise levels measured on-board were well under-requirements of the HSC code with levels averaging as low as 64.6 dB(A) in the forward main deck passenger lounge.

The vessels feature symmetrical slender twin hulls of the Paradis Nautica design fitted with aft interceptors of the Austal "Ocean Leveller" ride control system. The ride control and deck equipment share an integrated hydraulic system which has resulted in overall weight savings.

Interior accommodation for the 358 passengers was designed by Design Kontoret of Norway and outfitted by Austal Ships to a very high standard. Passenger seating over the two decks is arranged in a combination of airline-style and table-and-chair arrangements with 154 in the main deck forward lounge, 45 in the smoking lounge on the main deck aft, 26 on the upper deck forward with 133 aft. A sheltered sundeck is also located aft on the upper deck. The seating was supplied by Modell Mobler and seats have been fitted with individual audio stations with an outlet for headsets.

The elevated wheelhouse is accessed via the crew room on the upper deck and is set up for a four-man operation. Electronics equipment includes Kelvin Hughes radars, Ergopod and Simrad electronic chart system, Leica Differential GPS, Navtex GMDSS communication (Area 1) and Skipper echo sounder.

Two emergency evacuation stations are located aft, one on each of the side decks. Two 140-person liferafts (supplied by Selantic of Norway) are stationed under each side deck. In an emergency, the side decks are hinged up, the liferafts are deployed and inflated and the passengers walk down the steps to the evacuation platform and then into the liferafts. The evacuation trial carried out at Austal during yard trials successfully evacuated 188 persons from one station in 10 minutes 15 seconds.

Principal Particulars

Length overall	42.16 m
Length WL	40.9 m
Beam	12.5 m
Hull draft	1.6 m
Passengers	358
Crew	4
Engines	Two MTU 16V 4000 M70
Gearboxes	Two ZF 755-1
Propulsion	Two Servogear controllable pitch propellers
Service speed	34 knots at 85% MCR
Auxiliaries	Cummins 135 MXDWA

Draupner on trials
(Photo courtesy Austal Ships)

NEW SHIPS FROM INCAT TASMANIA

Avemar

Built for operation by Buquebus Espana SA between the Spanish mainland and the Balearic Islands , *Avemar* was launched on 14 May 1999. The 96 m *Avemar* is Incat's first 'Evolution 10' class vessel.

Avemar commenced service on Saturday the 31 July 1999 with Buquebus Espana on the 120 n. mi. route between Barcelona and Palma on the main Balearic island of Mallorca, a voyage of 3.5 h.

Founded in Buenos Aires in 1981, Buquebus has a longer involvement with fast vehicle-carrying ferries than most operators. Los Cipreses SA-Buquebus' entry into the high-speed field came in September 1992 with the introduction of the Incat-built 74 m wavepiercer *Patricia Olivia*, providing a 3 h service between Buenos Aires and Montevideo for 600 passengers and 110 cars.

In the ensuing years the company has taken delivery of a variety of high-speed craft and has direct operations in Argentina, Uruguay and Spain as well as charter agreements in Norway, Sweden and the UK. This year the company has 7 passenger/vehicle fast ferries (four of them Incat vessels) and one passenger-only vessel in worldwide service.

Avemar on trials
(Photo by Richard Bennett, courtesy Incat Tasmania)

Bentayga Express

Built for operation by leading Spanish ferry operator Fred. Olsen SA in the Canary Islands, *Bentayga Express* was launched (as *Benchijigua Express*) on 18 September 1999 from Incat Tasmania's Coverdales shipbuilding facility at Prince of Wales Bay, Hobart. In late October 1999, the 96 m wave-piercing catamaran entered service between Santa Cruz de Tenerife and Agaete, on the island of Gran Canaria, joining another Incat 96 m ferry already employed on the route, *Bonanza Express.*

Twenty-five years ago Fred. Olsen SA inaugurated a ferry route between La Gomera and Tenerife. Since then over 55,000 crossings have been made and 2 million vehicles and 15 million passengers have been transported. To celebrate this accomplishment and as a special anniversary present for the island of La Gomera, the company planned to introduce a new fast ferry reducing the crossing time on the 20 n. mi. route from 1 h 15 m to around 30 m. Due to reasons beyond the company's control, the shore ramps have not been completed and for this reason the introduction of *Benchijigua Express* on this service has been postponed for a few months.

As a result of the delay, Incat Hull 053 was renamed *Bentayga Express* during her delivery voyage. She will now enter service alongside *Bonanza Express*

between the ports of Santa Cruz and Agaete, where she will be based. Together, both ships will offer a wide range of timetables between the main islands creating a double bridge in the Canaries.

Passenger Spaces

The passenger area of *Bentayga Express* is 40% larger than Incat's earlier 96 m vessels, which has been achieved by extending the superstructure aft to the stern and much further forward than usual, almost to the bow. Designed to carry up to 900 people, all passenger accommodation is on one deck. Two classes of travel are offered; First, located at the extreme rear of the vessel, and Club, which takes up the remainder of the public space on Tier 2.

Freight

The vessel's vehicle deck offers a total of 330 truck lane metres (at 2.7 m wide and 4.3 m clear height) suitable for heavy, high and wide vehicles, and 370 car lane metres (at 2.3 m wide) giving the operator the flexibility to carry mixed traffic or up to 260 cars. The provision of a moveable mezzanine vehicle deck allows the ship to offer the necessary lane metres required for maximum car loading as well as offering the clearances demanded by oversize freight vehicles.

Control Station

Unlike earlier Incat wavepiercers, which had full-width wheelhouses, the raised control station onboard *Bentayga Express* is small. Its large windows provide 360 degree visibility while an aft-facing docking console and TV monitor obviates the need for bridge wings and their associated structural weight. The control station is fitted with the latest in electronic, navigation and communication equipment to comply with the High Speed Craft Code for Sea Area A2.

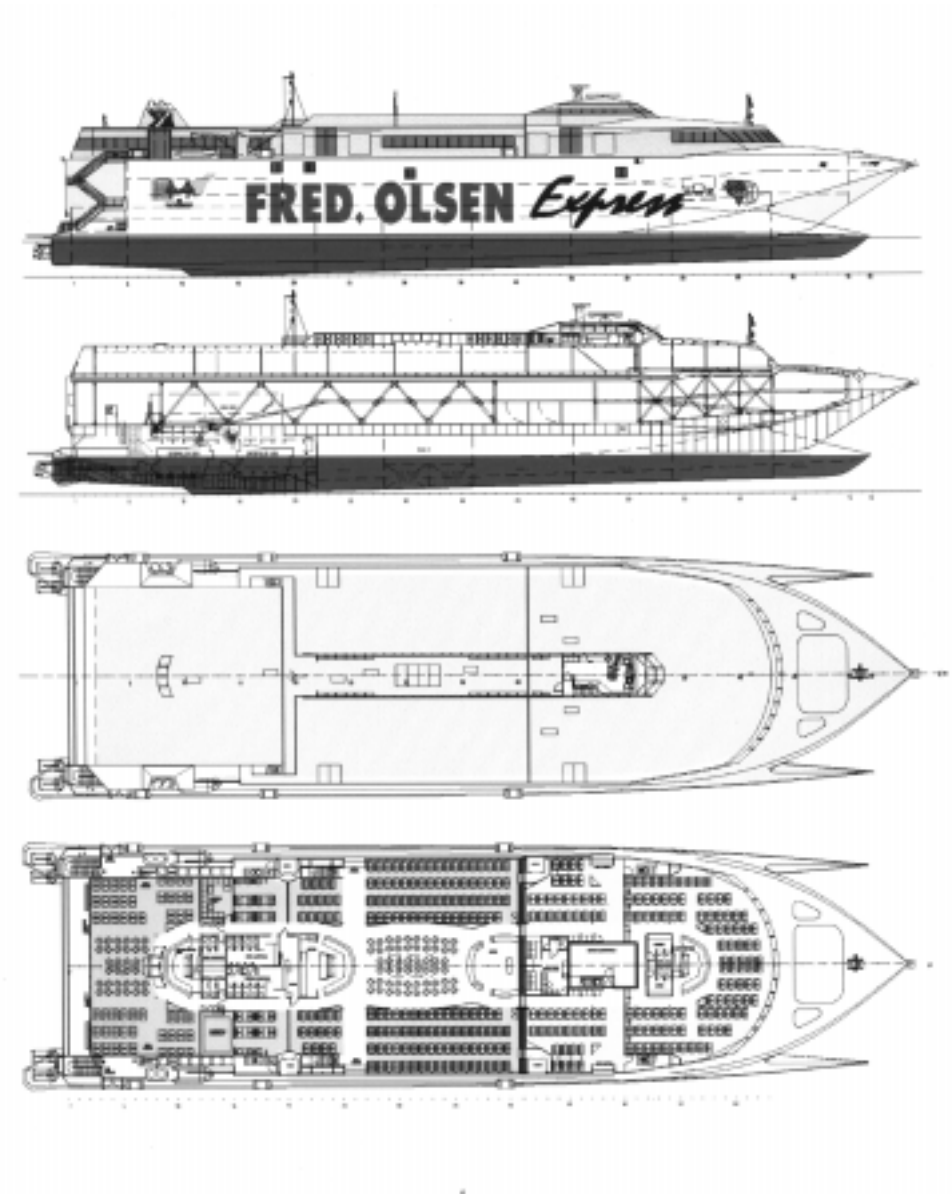
Powerplant

Bentayga Express is powered by four Caterpiller 3618 medium speed diesel engines, developing in excess of 28,000 kW, driving 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.

Specifications

Certification	DNV +1A1 HSLC R1 Car Ferry "B" EO Certificate
Length overall	96.00 m
Length waterline	86.00 m
Beam OA (ex fenders)	26.16 m
Draft	4.00 m
Hull beam	4.50 m
Deadweight	718 t
Speeds (100%mcr)	46.7 kn lightship 40.37 kn @ 675 t
Main Engines	Four Caterpiller 3618 marine diesels each 7080kW @ 1030 RPM.
Transmissions	Four Reintjes VLJ6831
Waterjets	Four Lips 150 D waterjets configured for steering and reverse
Alternators	Four Caterpillar 3406B 230 kW alternators supplying 415 V 50 Hz

Betayaga Express on trials (as *Benchijigua Express*)
(Photo by Richard Bennett, courtesy Incat Tasmania)



The general arrangement of *Bentayga Express*, built by Incat Tasmania and delivered in October 1999 to Fred. Olsen S A for service in the Canary Islands.

QUEENSLAND NEWS

In the Brisbane area the major builders have remained busy, with vessels under construction and a number of new orders in the last three months. Aluminium Marine will shortly be launching a 24 m dive catamaran for operation in the Barrier Reef region. The vessel can carry 100 passengers and a crew of five. A new order has just been placed with the yard for a 20 m, 120 passenger ferry for Moreton Bay. Following the completion of a 25 m low-wash ferry, Brisbane Ship Constructions are designing and building another passenger catamaran. Norman R Wright & Sons have recently delivered a fast low-wash catamaran ferry for Big Cat Cruises in North Queensland, with seating for 134 passengers. Presently under construction at Oxford Yachts**,** a new company in Brisbane, is a 24 m passenger ferry for export to Indonesia and a high-speed luxury monohull motor yacht. South Pacific Marine, located in Caboolture, just north of Brisbane, specialise in steel car ferries. They are building a 35 m car ferry for Island Transport.

Noosa Cat Australia is currently developing their 4400 series, 12 m length by 4.5 m beam catamarans. The hull mould is complete and the deck plug is under construction. The vessel is to be marketed in a commercial version, a para-military version and a standard luxury version. The new 2300 series 'walkabout' has been released and this is the first walk-around centre-cab catamaran in production in Australia. Several boats have been completed and follow-up orders are in production.

In North Queensland a refit has recently commenced on HMAS *Wewak* at Tropical Reef Shipyard in Cairns. HMAS *Wewak* will be the first of five and possibly six LCH class vessels to undergo a life extension at the shipyard. As part of the life extension the RAN vessels will undergo galley and communications centre upgrades and will be provided with new navigation aids. Their aging hulls will be surveyed and problems of hull buckling will be corrected. The LCH vessels are currently being used to support both the Bouganville peace-keeping forces and the United Nations INTERFET forces in East Timor.

The 15 metre custom-built game-fishing boat *Desperado* was recently launched after 12 months of construction in the Far North. The vessel is a sister ship to the successful *Kanahoee*.

NQEA have recently delivered two 37 m high-speed low wash ferries to The Netherlands. These ferries were designed by NQEA as the River Runner 200 Class. The DNV-classed ferries are capable of transporting 150 passengers and 20 bicycles at a service speed of 30 kn. Construction of five NQEA designed River Runner 150 Class low wash ferries is also underway in The Netherlands.

Work is also continuing at NQEA on the 85 m hopper suction dredge for the Port of Brisbane and on the final stages of the RAN Hydrographic vessels *Melville* and *Leeuwin*.

Subsee Australia is progressing with the construction of a 24 m low-wash catamaran for a local reef operator. The vessel, due to be completed in April next year, will be capable of transporting 100 passengers at 25 kn.

On the Gold Coast, Cougar Catamarans in a joint project with Aussie Fish Pty Ltd has begun sea trials of their new commercial and mother-ship *Australian Standard*. Constructed in fibreglass, the 20 m lenght OA, 12 m beam, 150 t catamaran is powered by two 149 Series V12 Detroit engines and Perkins loiter engines through conventional shafting and propellers. The vessel features deep freezers, snap freezers, and climate-controlled work and accommodation decks and is capable of complete product processing while operating in the Gulf Region for extended periods.

John Lund Marine Design Pty Ltd on the Gold Coast is busy with a wide variety of interesting projects including FRP and steel production cruisers and extensive modifications to a coastal landing craft. The landing craft project involves lengthening the vessel by 35 m, completely replacing the superstructure, new ramp and winch gear as well as re-powering and a comprehensive electrical upgrade. The cruisers are 21 m length OA, with a displacement hull and single screw propulsion. Tank testing was carried out at the Australian Maritime College in Launceston. Construction of the first vessel is due to commence in Vietnam before the end of the year.

Brian Robson

NEW SOUTH WALES NEWS

New Construction

ADI Limited has made application for the survey of the STA Ferries' twelve new Supercats. Designed by Grahame Parker Design, the Supercats have a length OA of 34.12 m, length WL 32.54 m, maximum beam 8.80 m, demi-hull beam 1.88 m, draft 1.50 m, speed 24 kn, and can carry 250 passengers, 8 bicycles and 3 crew. The hulls are of aluminium alloy and the superstructure is GRP. Powering is by two MTU V12 2000 M60, producing 600 kW brake power @ 1800 rpm, giving 24 kn for a range of 384 n. mi. The vessels will

be built to DNV +1A1, and can operate on the harbour and on the Parramatta River. The first three vessels are expected to be operating for the Olympics. The *ANA* expects to report on these state-of-the-art catamarans in a forthcoming issue.

New Designs

Commercial Marine Design is working on the design of a 42 m purse-seiner for South Australian interests. The vessel will be classed by the American Bureau of Shipping, surveyed by the South Australian Department of Marine and Harbours, and it is expected that the vessel will be built in South Australia. Tenders closed recently for the supply of the main machinery.

Greg Cox is working on the design of the Supershuttle, a $15 million fast monohull ferry proposed to run between Gosford and Sydney. The operator, a consortium of Australian and Hong Kong interests, plans to run three ferries each carrying 450 passengers, leaving Gosford on the hour from 5 am to 11 pm on weekdays, at a cost of $10 for the 70-minute trip. The vessels will be powered by twin gas turbines burning compressed natural gas to minimise pollution. The project moved closer to fruition in late October, when an 8-metre one-eighth scale model was used for wash tests on Newcastle harbour with Greg Cox at the helm. It is anticipated that the ferries will be constructed at a purpose-built facility on Kooragang Island in Newcastle Harbour.

Around and About

Long-time customers of Edwin Bowers and Sons, nautical instrument makers in Sydney, will be saddened to learn of the recent death of John Bowers, grandson of Edwin. The company was founded in 1895 by Edwin and his sons Bruce, Ross, Max and Colin, and has served Sydney well for 104 years. John, Max's son, was apprenticed in the business in 1932 and became one of the mainstays. His expertise and cheerful disposition will be missed.

Australia already has the first woman to sail solo nonstop around the world (Kay Cottee), and the youngest man to sail solo around the world (David Dicks or Jessie Martin, depending on your point of view). Now, in the Year of the Older Person, Jack Christofferson plans to enter the Guinness Book of Records as the oldest person to sail solo around the world. Jack is the well-known proprietor of JBC Engineering at Careening Cove, Sydney. He has completed twenty Sydney–Hobart yacht races, numerous local and interstate offshore events, competed in two Admiral's Cup regattas, was foredeck boss on *Gretel II* in Australia's 1977 America's Cup challenge, and has already completed a two-year, two-handed circumnavigation. He now has a purpose-built, cutter-rigged Northshore 46, and will leave Sydney on 19 December this year, five days after his seventieth birthday. His "club of record" is the Royal Sydney Yacht Squadron.

Sydney Heritage Fleet's vessel *James Craig* was towed down the harbour and subsequently dry-docked at ADI Marine, Garden Island on 21 October. To fit under the new Anzac (Glebe Island) Bridge, she had to have the fore and main top-gallant masts and the top yards lowered, but still looked majestic during the move. While in dock she will have the sterntubes, shafts and propellers fitted, the hull will be blasted and painted, and various internal electrical and mechanical items completed. She is expected to be undocked in mid-November, and will then berth alongside Wharf 7, Darling Harbour (the new home of the Sydney Heritage Fleet) for final fitting-out. Conducted tours of the vessel are expected to commence in January 2000, with basin and sailing trials in April/May, and operation in June.

The Sydney Heritage Fleet has recently re-commissioned several vessels which have undergone extensive refits. These include:

Berrima, the 11.7 m (38 ft) workboat built in 1954 by Cam Fisher at Kurnell for Australian Oil Refineries (now Caltex), and now in daily use ferrying Sydney Heritage Fleet personnel to and from Garden Island during the *James Craig*'s docking;

Protex, the 10.4 m (34 ft) ex-Nicholson ferry, built in 1909;

Kookaburra, the 7.9 m (26 ft) speedboat which carries the skipper and fourteen passengers in four cockpits; and

Harman, the 12.2 m (40 ft) ex-Cockatoo Dockyard workboat.

It is expected that work will begin in the new year on the restoration of the ex-Sydney ferry *Kanangra*.

The Royal Australian Navy's Huon class minehunter project has won the 1999 Engineering Excellence Award of the Newcastle Division of the Institution of Engineers, Australia. ADI is building six minesweepers at their facility in Newcastle. The $1 billion project is reportedly on schedule and within budget. Having won the Newcastle award, the project will proceed to the Institution's national finals in November where it will compete with the winners from eight other divisions.

Phil Helmore

FIRST RAN GUIDED MISSILE DESTROYER PAYS OFF

On the morning of Saturday 11 September 1999 the oldest ship in the Royal Australian Navy, the guided missile destroyer HMAS *Perth*, steamed slowly over a sunlit sea towards Sydney Heads for the last time. After thirty-four years of service to Australia, the destroyer which had introduced a new era to the Navy was paid off on 15 October.

In the financially-constrained environment of the 1950s, the RAN comprised ships of a British design origin, even though many were Australian built. The Daring class destroyers and the Type 12 frigates were under construction in Australia, and although these ships were expected to provide the Navy with an excellent anti-submarine capability, it was clear that the surface warfare and anti-air warfare capability of the fleet would be deficient. By the end of the decade, the need for modernisation was pressing, as the Navy was still largely dependent on equipment and technology that had been developed during, or as a consequence of, the Second World War.

Further impetus was given by the government decision of December 1959 to disband the Fleet Air Arm by 1963. Whilst the carrier *Melbourne* would be reprieved and ultimately remain in service for another two decades, this decision forced the RAN to find a new surface warship to give the fleet an anti-air warfare capability. The development of surface-to-air guided missiles during the 1950s would shape the armament of the new ships. The US Tartar anti-aircraft missile and the Australian-designed Ikara anti-submarine guided missile were the favoured weapons.

The choice of ship was essentially between the British County class destroyer or the US Navy's Charles F Adams (DDG 2) class guided missile destroyer. Both were large ships by RAN standards. The County class ships were some 520 feet long and over 6,000 tons full load displacement, and were powered by a combination of steam and gas turbines. They required a crew of nearly 500 men. The design characteristics were heavily influenced by the need to accommodate the Seaslug guided weapon, which had been under development since the 1940s and consumed a considerable hull volume. The benefits of this volume were evident in a large well-proportioned ship with characteristics that even influenced the design of the US Navy's Spruance (DD 963) class destroyers in the 1970s. Eight of the County class ships were built for the Royal Navy.

The Adams class destroyers were smaller with an overall length of 437 feet and a full load displacement of about 4,500 tons. They were propelled by high-temperature, high-pressure steam turbine machinery, and had a complement of around 300. Their design had begun in 1955 following the approval of the Tartar missile programme as a missile-carrying version of the then US standard destroyer, the Forrest Sherman

HMAS *Perth* in April 1970
(Photograph John Jeremy)

(DD931) class. The ships were actually ordered before the Tartar missile had even flown for the first time. In the end, it proved necessary to enlarge the DD 931 design, but the resulting ship was still considerably more compact than its British counterpart, principally due to the low volume of the guided missile launching and handling system. Extensive use was made of aluminium in the superstructure to reduce top-weight, and there were many compromises in the design, which was regarded by some in the US Navy as cramped, uncomfortable and difficult to maintain. Twenty-three ships of the class were built for the USN.

Some consideration was given to building the County class in Australia as the Type 12 frigates completed. However the Admiralty was unwilling to modify the design to incorporate RAN features and preferences and the RAN decision was finally based on superior weapons, namely the Tartar missile and the 5" 54 calibre gun instead of the Seaslug missile and the 4.5" gun in the Mk 6 twin mounting. The DDGs, based on US construction, were also cheaper, and in 1961 the decision was made to order two ships from the United States.

The break from the all-British tradition was contentious with some, particularly because of the consequences for logistic support, but the move was strongly supported by the then Minister for the Navy, Senator John Gorton. The decision to build the ships overseas was also disappointing for the Australian yards. Nevertheless, the purchase of these destroyers was the start of a shift in the RAN towards a greater integration with US Navy which was to prove utterly appropriate.

The first two ships were ordered from the Defoe Shipbuilding Company in Bay City, Michigan, where they were built with very basic facilities and launched sideways into the fresh water of the lake for fitting out. HMAS *Perth* was commissioned into the RAN in 1965, and was followed shortly after by her sister ship HMAS *Hobart*. A third ship, *Brisbane*, was also ordered from Defoe and completed in 1967.

The main difference between the Australian ships and their US cousins was the addition of a magazine and two launchers amidships for the Ikara missile in place of the US ASROC anti-submarine missile launcher.

By the time HMAS *Perth* arrived in Australia in March 1966, the Vietnam War was gathering pace and plans for a significant RAN contribution were being developed. The DDGs with their logistic commonality with US ships were obvious choices for service with the US Seventh Fleet. Soon after arrival, *Perth* was taken

HMAS *Perth* at sea in 1986
(Photograph John Jeremy)

in hand at Garden Island to fit Ikara, so the first DDG to serve in Vietnam was *Hobart*.

Perth saw active service in Vietnam from September 1967 to April 1968 and again from September 1970 to April 1971. She was awarded the US Navy Commendation and the Meritorious Unit Commendation in recognition for the performance of the ship and her company.

HMAS *Perth* was modernised twice. The first modernisation was carried out in the United States in 1974. It involved the replacement of Tartar with Standard SM-1MR, new gun mountings, the installation of the naval tactical data system (NTDS) and modern radars. A further modernisation was carried out in Sydney in the 1980s when extensive improvements to weapons and sensors were completed and the Mk 13 guided missile launcher system was modified to take the Harpoon surface-to-surface missile. Finally, in 1990/91 all the Australian DDGs were fitted with the Phalanx CIWS, a modification not carried out on any other DDG 2 class destroyers.

The DDGs were an inspired purchase for the RAN, and they have served Australia well. They are capable and handsome ships with presence, and their departure from the fleet will leave a considerable capability gap.

Despite her age, HMAS *Perth* looked immaculate as she steamed into Sydney for the last time. The ship has been given to the Government of Western Australia and will be towed to Fremantle, probably to be sunk as a dive site off Western Australia.

John Jeremy

FAST '99

The Fifth International Conference on Fast Sea Transportation (FAST '99) was held in Seattle, Washington, from 30 August to 2 September 1999. The lead planning organization was the North-American Section of SNAME. This very successful symposium followed the fourth meeting in the series which was held at UNSW in July 1997.

A total of 286 delegates attended the conference, representing 17 countries. A 959-page set of conference proceedings containing the 88 selected papers was produced.

The main types of fast ferries that were considered were monohulls and catamarans. The more exotic types of craft, such as hydrofoils, surface-effect ships, and ekranoplans, played a somewhat subdued role this time, in contrast to their more prominent position in previous FAST conferences.

Controversial papers included the troublesome matter of wave-wake generation by high-speed ferries. There was some disagreement amongst the delegates about the best way to optimise the hull shape in order to minimise the waves.

The problem here was the correct way of making a fair comparison between contending vessels for a particular route. Another debate-generating topic was the future of cargo-carrying fast vessels, as opposed to passenger-and-vehicle ferries.

An enjoyable post-conference tour was highlighted by a technical visit to the first PacifiCat catamaran, which travels the route between Vancouver and Nanaimo in British Columbia.

This vessel was designed by International Catamaran Designs in Sydney and was the subject of Rob Tulk's technical presentation to a joint RINA/IMarE meeting in Sydney during 1998. The members of the group were given an impressive specialist tour of the vessel, which emphasized Australia's leading position in this area.

The sixth FAST conference will and will be held in Southampton on 4–6 September 2001.

Lawry Doctors

WORKSHOP ON THE DESIGN OF HIGH-SPEED FERRIES

Another very successful workshop was held at The University of New South Wales on 27–29 September 1999. This subject has been treated a number of times in the past; however, because Australia continues to be the leader in the design and construction of high-speed vessels, it was decided by the Naval Architecture Program to run this event at UNSW again. The main organiser was Dr Prabhat Pal, Honorary Visiting Fellow, ably assisted by Associate Professor Lawrence Doctors.

The comprehensive three-day program consisted of twelve specialist lectures of a very high technical level. Two of the presenters had made a special trip to Australia for this purpose, from the US and from the UK. Topics addressed included hydrodynamics of resistance and motions, structures, design, economics, safety, vessel layout, ride-control systems and naval perspectives.

The workshop was characterised by spirited discussion, which was particularly useful as it meant that an excellent interaction between persons with differing expertise was taking place. A major theme of the discussion was the ultimate efficiency of high-speed marine craft, as expressed by the so-called transportation factor, or lift-to-drag ratio. To this end, the serious matter of reducing skin friction (the dominating drag component for these vessels) was addressed in some detail.

Lawry Doctors

At the Workshop: Michael Andrewartha, Kerry Byrne, Martin Grimm, Mori Flapan, Chris Fell, Bill Barlow, Prabhat Pal, Richard Arthur, Lawry Doctors, David Bruce, Ray Toman, Darren Sanford, Lindsay Emmett and Bruce McNeice (Photograph by Ruben Spyker)

STAB 2000

STAB2000, the seventh International Conference on the Stability of Ships and Ocean Vehicles, will be held at the Novotel Hotel in Launceston from Monday 7 to Friday 11 February 2000 and will be the highlight of the Australian maritime calendar in 2000. The conference is being organised by a National Committee under the banner of the Australian Maritime Engineering CRC Ltd, supported by the Australian Maritime College, the University of New South Wales, the Australian Maritime Safety Authority, the Institute of Marine Engineers and the Royal Institution of Naval Architects.

The conference will be opened by Mr David Goodrich, President of the Royal Institution of Naval Architects and the welcome address at the first evening's dinner will be given by Profesor Chengi Kuo from the University of Strathclyde. A total of seventy papers have been accepted for presentation from one hundred abstracts submitted, and the majority of papers have been refereed.

The objective of this series of conferences is to promote a full exchange of ideas and methodologies regarding the stability and operational safety of ships and ocean structures and to provide an opportunity for naval architects, capsize prevention researchers, regulatory agencies, inspection and certifying authorities, ship and floating platform owners, consultants and operators to present, discuss and listen to improvements in capsize prevention for all types and sizes of floating structures.

The conference will address a wide range of topics related to the above theme, including:

- Damage stability of Ro-Ro vessels;
- Capsizing of vessels in following and quartering seas;
- Stability of high-speed craft;
- Design and regulatory aspects;
- Updates on stability criteria;
- Model testing and correlation;
- Computer techniques in research and operations;
- Stability of ocean engineering structures;
- Stability in operations; and
- The human/vehicle stability interface.

Examples of refereed papers selected for presentation in these areas are:

Investigation into the Capsizing of Damaged Ro-Ro Passenger Ships in Waves, A. Papanikolaou *et al.*, University of Athens, Greece. This paper derives from current research of the Ship Design Laboratory of NTUA on the damaged stability of Ro-Ro passenger ships in waves in view of recent regulatory developments to allow the physical modelling of damage stability in waves as an alternative to the so-called "water on deck" regulatory concept.

Stability of Japanese Purse Seiners, N. Umeda *et al.*, National Research Institute of Fisheries Engineering, Japan. In the last ten years, three Japanese purse seiners have capsized in heavy seas, although purse seiners are the major fishing vessels in Japan. The paper shows that, of the three wave directions, capsizing occurs more readily in quartering seas.

A Comparative Following Seas Investigation of a Catamaran and Monohull Vessel, A. Tuite *et al.*, Australian Maritime College. Designers and operators are well aware of the dangers associated with operating vessels in a severe following sea. A non-linear mathematical model was developed to investigate the extreme behaviour and associated dangers of vessels operating in following seas. The effect of the position of a vessel in the wave on the manoeuvring characteristics, the wave forces, the rudder effectiveness and the transverse stability is taken into account. This model will be used to compare the behaviour of a conventional catamaran vessel and monohull vessel operating in severe following seas.

Yacht Performance Downwind in Waves – A Preliminary Investigation, D. Harris *et al.*, Australian Maritime Engineering CRC. Investigation into the upwind performance of yachts in waves has been the focus of extensive yacht research since the 1970s. Until recently little work has been carried out into the performance of yachts in following waves. A racing yacht's ability to sail fast in following waves is significant since each yacht will spend part of its racing life sailing downwind. An America's Cup yacht will generally sail downwind for approximately one leg of the course in five, whilst ocean racers, e.g. entrants in the Volvo and Vendee Globe round-the-world races, may spend up to 60% of a 32,000 n. mi. race sailing downwind in large ocean swells. This paper describes the preliminary stages of an investigation into downwind sailing performance in following seas.

Stability, Operativity, and Working Conditions onboard Fishing Vessels, G. Boccadamo *et al.*, University of Napoli, Italy. Statistics show a dramatic increase in the number of accidents occurring to fishermen; human error is also a cause of disasters involving small ships. The paper analyses the geometrical and mechanical characteristics of small vessels which influence the working conditions onboard and the fea-

sibility and effectiveness of stabilising devices which can increase crew safety.

There will be specialist workshops on intact stability, damaged stability, nonlinear dynamics, environmental modelling and a special one on the stability of ocean racing yachts. Of further interest to the sailors will be the Workshop on Yacht Performance Prediction being held by the Australian Maritime College in the week immediately following STAB2000 (see *Coming Events* in this issue).

The range of topics and the comprehensive programme of papers, together with the specialist workshops, make this a conference not to be missed. Full details of the programme (including the pre- and post-conference tours and cheap inbound flights) are available on the web-site.

Those interested in attending or obtaining further information should contact:

STAB2000 Conference Secretariat
c/o Australian Maritime Engineering CRC Ltd
PO Box 986
Launceston Tas 7250
Tel: +61-3-6335 4875
Fax: +61-3-6326 6261
Email: STAB2000@crc.amc.edu.au
Web-site: http://www.amc.edu.au

SEA AUSTRALIA 2000

All RINA members will have been alerted to this important conference being held at the Darling Harbour Convention Centre, from 1 to 3 February 2000.

A very attractive programme of papers has been assembled, embracing a wide area of maritime technology, with papers from many world-renowned authors. A copy of this programme has been sent to all members of the Australian Division of RINA.

This will undoubtedly be the premier maritime conference during 2000 and every effort has been made by the organising committee to attract maximum attendance.

Held in association with the Pacific 2000 Exhibition it will, in effect, present Australia's maritime showcase to the world. The registration fee of $600 is highly competitive in comparison with charges for comparable international maritime conferences, and is moreover of all meals and the evening reception.

The venue — the Sydney Convention and Exhibition Centre — is a magnificent state-of-the-art complex, situated on the harbour foreshore and closely adjacent to the city centre. Its many auditoria are ideal for just such a conference, enabling the various streams to be accommodated within the complex and on the one level.

Reception and registration will be on the ground floor, close by the main entrance, while the conference rooms are on the third floor.

Morning and afternoon teas will be served in the lobby adjacent to the conference rooms, while luncheons will be in Exhibition Hall 3 on the ground level, with the Pacific 2000 maritime exhibition displays in the adjacent Halls 4 and 5. This will provide registrants with the opportunity to visit the exhibition during the lunch break or after the conference discussions close in the afternoon, during the complimentary 'happy hour' being provided.

Apart from the discussion sessions, the conference will provide a forum for all sectors of the maritime industry to meet and exchange views on the many diverse and challenging developments taking place. These include innovations in marine design and transportation concepts, novel aspects of maritime propulsion and economic operations, the latest trends in port handling techniques, maritime safety in its various facets, and the marine environment.

Some ninety papers from sixteen countries — a mark of the international content of the conference — will be presented, with an emphasis on innovation and the latest developments in the maritime field. Not unnaturally two areas have been highlighted — fast transportation, in which Australia has built up an enviable reputation that it is keen to maintain, and naval topics with which Australia currently has a very close involvement.

The RINA has been the leading organisation in the evolution of the Sea Australia 2000 Conference, and the President and Chief Executive of RINA will be coming from the UK to take leading roles. The RINA President, Mr David Goodrich, will be giving the opening address.

All members of the Institution are urged to make every effort to come and support this prestigious event. It will not only be rewarding in terms of the technical content, but also with regard to the opportunity it provides to meet up with renowned people within the international and local maritime industries.

Bob Campbell
Chairman of the Organising Committee

EDUCATION NEWS

Curtin University

Stephen Cook, a PhD student who is supported by the AMECRC, has recently completed a further set of sea trials on the experimental catamaran *Educat*. The results of these experiments will be presented at the RINA Hydrodynamics of High Speed Craft conference in London at the end of November.

Another PhD student Dougal Harris, who is studying the performance of yachts sailing downwind in following seas, will be conducting further towing tank experiments at the Australian Maritime College in December. These experiments will be focussing on the effect of irregular seas on the longitudinal wave forces.

The Centre for Marine Science and Technology at Curtin University (CMST) is currently seeking WA State Government support in order to expand its activities. This will hopefully enable the development of further facilities, new research staff positions and PhD student opportunities.

The Department of Mechanical Engineering is developing a series of marine units to include in its undergraduate courses. Prospective students interested in studying Mechanical Engineering with a marine bias should contact the Head of Department, Dr Kian Teh on (08) 9266 7047 for further information.

Giles Thomas

The University of New South Wales

Mr Trevor Blakeley, Chief Executive of the Royal Institution of Naval Architects, visited UNSW on 6 October and met with the naval architecture students and staff. The purpose of the visit was to present latest developments in RINA to attract students to the institution and to demonstrate what is being done to enhance the profession. Mr Blakeley's lunchtime talk aroused much interest, as evidenced by the number of questions that he had to field afterwards.

The RINA and Marconi Marine have jointly offered an award of $500 and a certificate for the best presentation on a naval architectural project at UNSW. Mr Blakeley attended the School's annual undergraduate thesis conference on 8 October, where the following presentations on naval architectural projects were made:

Michael Andrewartha: *The IMO Severe Weather Criterion*
William Boddy: *The Modification of Merchant Shipping to Provide Humanitarian Aid, Disaster Relief and Peace-keeping Operations*
Lina Diaz: *Photogrammetric Hull Measurement*
Shinsuke Matsubara: *Desingularised Potential Flow on Arbitrary Forms*
Vasavas Nonsopa: *Structural Analysis and Optimisation in a Ship's Engine Room*
Simon Robards: *The SY* Boomerang
Damien Smith: *Hydrodynamics of Sailing Vessel Appendages*
Jude Stanislaus: *Preliminary Design and Optimisation of a SWATH Ship using DSP Techniques*
Delwyn Wee: *Minimisation of Sea-inlet Resistance of Fast Craft*

Assessment was made on the basis of marks awarded by School staff, with marks being standardised to remove the effects of marker variability. The inaugural award went to Michael Andrewartha for his presentation on *The IMO Severe Weather Criterion*, and was presented by Mr Blakeley at the thesis conference dinner at The Grace Hotel on the evening of 8 October. Congratulations, Michael!

At the thesis conference dinner, the School's 135 final-year students also made their annual award for Lecturer of the Year, with a new award this year for Academic of the Year. The difference is that lecturer is for class work, and academic is for help outside (i.e. not associated with) classes. The lecturer award was inaugurated in 1995, and last year's students built a perpetual trophy from a melted laptop computer mounted on a wooden stump with a silver crest and silver shields for each year of award. This year The Academic of the Year award went to A/Prof. Robin Ford and Lecturer of the Year to Mr Phil Helmore. Each was presented with a bottle of Grandfather port, and Phil sits the trophy in his office for a year. Congratulations to both.

The Australian Maritime College once again acted as hosts to our third-year naval architecture students. The visit took place on 4 and 5 October and was organised principally by Mr Gregor Macfarlane and Mr Richard Young of the AMC.

During their visit, the students used the towing tank for conducting calm-water resistance tests and for regular-wave ship-motion tests. They subsequently compared the experimental data with theoretical techniques. The students were also shown the other experimental equipment at the College during their visit.

By way of thanks, Associate Professor Lawrence Doctors gave a presentation on his theoretical work related to the resistance of high-speed multihull craft to AMC staff and students. Much of this research work

had been done on a cooperative basis between UNSW and AMC.

Further changes are underway in the naval architecture degree course. A new industry liaison committee met on September 30, firstly with the Head of School, Prof. Kerry Byrne, and then with the entire naval architecture staff. A full and frank discussion ensued, regarding the current format of the course and ways in which it can be improved, and as many of these ways as possible will be implemented for 2000, in addition to those already under way.

Our naval architecture students with Dr Prabhat Pal visited the tanker *Samar Spirit,* while at anchor in Botany Bay on Saturday 23 October. *Samar Spirit* has a length of 245 m, can carry 100 000 t deadweight, was delivered in 1992 to Andros Spirit Inc., Bahamas, and is operated by Teekay Shipping (Australia) for Caltex. She operates on the Brisbane–Sydney–Melbourne run, with occasional voyages to Viet Nam. The students enjoyed the boat trips to and from *Samar Spirit,* and were met by the captain, Donald McAlpine. He personally showed them over the ship, including the bridge, engine room, control room, steering compartment, and the deck and mooring equipment. Many thanks to Teekay Shipping for the visit, and to Captain McAlpine for his time and excellent explanations for the many questions from the students during the tour.

At the october graduation ceremony Dugald Peacock was awarded his PhD degree for his thesis *Decision-based Hydrodynamic Design of Displacement Monohulls*. Congratulations Dugald!

Phil Helmore
Lawry Doctors

Australian Maritime College

Interesting presentations were given during July by Dr Dian Georgiev of Mitsubishi Heavy Industries, Japan, on *A Variational Approach to Analysis of Marine Propeller Flow and Deflections in Uniform and Non-uniform Stream* and by Dr. Roger Calcraft, CSIRO Principal Research Scientist (Non-ferrous Technology Group) on *Recent Activities — Developments and Innovations in Aluminium Welding* .

The final year students of naval architecture presented their ocean vehicle design projects on 31 July, and Captain Roger M Davis, retired marine surveyor, spoke on *Collisions and Hydrodynamic Interaction* on 13 August.

Dr Angus McEwan, the ex-Chief of Oceanography at CSIRO, gave a very interesting talk on Australia's new Oceans Policy on 2 September. He was quite clear that there should be opportunities for the AMC and that the new policy is a positive step forward in managing the oceans around Australia.

Gaspar Guzvanj, a research scholar at the AMC presented his work on *A New Technique for Determining the Safe Maximum Vessel Size for Operation in a Port* on 24 September.

A/Prof. Lawrence Doctors, from the University of New South Wales, presented his recent work on *The Great Trimaran-Catamaran Debate* on 4 October. The week culminated with a visit by the Chief Executive of RINA, Mr Trevor Blakeley. The seminar series concluded with a talk by Kevin Gaylor, Senior Research Scientist of the Maritime Platforms Division, DSTO, on *Smart Ships and Reduced Crewing*.

On 6 November the final year students of naval architecture presented their research work on the following topics:

C Polis: *Flow over a two-dimensional hydrofoil with a cavity*
J Ekin: *An investigation of waterjet inlets using computational fluid dynamics 2*
G Green: *Modelling fire main problems on RAN ships*
T Phan: *Slamming of high-speed craft*
D Gregorevic: *Motion analysis by regression methods*
J Theleritis: *Forces on cylinders due to fifth-order waves*
N Barratt: *Motions of high-speed vessels in various sea states using strip theory and experimentation*
M Blackman: *Fatigue analysis of aluminium joints*
A Vosailagi: *Investigation of crack initiation in the valve bridge region of diesel engine cylinder heads*
A Richards: *Predicting strength degradation of composite materials due to submersion*
A Verth: *An investigation into the generation of wave-wake by high-speed vessels*
A Sumual: *An investigation of waterjet inlets using computational fluid dynamics 1*
A Kaitara: *An investigation into the ultimate strength of ship structures*
J Steel: *Capsizing and self-righting of racing yachts*
R Dreverman: *De-lamination testing for composite materials*
M Cabot: *Deck-diving of catamarans in following seas*
M Carmock: *Catamaran resistance through regression analysis*

Guests at the presentation included Professor Beverley Reynolds, Chair of Woodside Oil & Gas Engineering at the University of Western Australia, AMC Council member Doug Beck, the Chief Naval Architect with Tenix and Dr Seref Aksu of DSTO.

Prasanta Sahoo

Seakeeper Software

Seakeeper, the latest addition to Formation Design Systems' Maxsurf suite of naval architecture software, is a new seakeeping analysis package to help designers predict the motion response of Maxsurf designs.

The program uses the strip theory approach to predict the vertical motions of a vessel in head to beam seas. Seakeeper reads a Maxsurf design file directly and extracts from it the required geometry data. The user then specifies the wave spectrum and heading, vessel speed, and several other parameters.

The predicted response of the vessel to the wave spectrum is calculated as a series of response amplitude operators (RAOs), a well-established, non-dimensional method of comparing the amplitude of ship motions relative to that of the wave. Also calculated are the added resistance, significant motions, velocities and accelerations of the vessel in the specified sea spectrum. The results can be displayed as a series of graphs and are also available in tabular form. All data may be copied to spreadsheets and other applications for presentation purposes or for further analysis.

Seakeeper is based on a strip-theory analysis code originally developed at the Australian Maritime Engineering Co-operative Research Centre at Curtin University of Technology. Formation Design Systems and the AMECRC carried out a joint research programme to upgrade the software and make it available on the Windows platform. Seakeeper has now been integrated with the rest of the Maxsurf range and features the same graphical interface found in the other programs.

Prior to the release of this Windows version, Seakeeper was used extensively by the AMECRC for both commercial and research applications. Seakeeper has been validated against a variety of data from various independent sources: model tests, full-scale trials and other numerical methods.

With the acquisition of Seakeeper, designers have access to powerful numerical techniques for predicting vessel motions. Full integration into the Maxsurf range, combined with an easy-to-use interface, makes the seakeeping analysis straightforward and fast.

A number of alternative designs can easily be accessed and compared for seakeeping performance; Seakeeper is able to calculate heave and pitch response over a complete frequency range in a matter of seconds on a Pentium II PC. Comparisons of different vessels can be made by examining the RAOs or by calculating the significant motions and accelerations for a specified sea spectrum.

For further information, contact Formation Design Systems, PO Box 1293, Fremantle 6160, phone (08) 9335 1522, fax 9335 1526, email `info@formsys.com` or web-site `www.formsys.com`.

NSRP Reports

Further reports of projects conducted as part of the United States National Shipbuilding Research Program that could be of interest to Australians are now available in electronic form on the Internet. Copies can be downloaded (for a fee) from `www.nsnet.com/docctr`.

NSRP 0534 (N6-95-1)

Standard Commercial Ship Test and Inspection Plan, Procedures and Database

The standards and specifications that the US shipbuilding industry must follow are often inconsistent and sometimes inadequate. These standards and specifications are contained in numerous reference sources and are enforced by multiple regulatory bodies, classification societies, government agencies and owners. Although shipbuilding technology has continued to make significant improvements that have reduced portions of design and construction manpower requirements, one area that is contributing to expanding construction schedules and increased cost is the area of test and inspection. This project investigates existing rules and regulations for testing and inspection of commercial ships and identifies differences and similarities within the requirements. The results include comparison matrices, a standard test plan, a set of standard test procedures, and a sample test database developed for a typical commercial ship.

NSRP 0537 (N6-95-2)

Leapfrog Technology to Standardise Equipment and System Installations

By NASSCO

The objective of this manual is to develop a set of equipment and distributive system installation standards that result in the lowest possible installed cost. These standards are to be parametric in nature and lend themselves to inclusion into a product modelling system. Leapfrog Technology is defined within this project as a holistic, cost-effective approach to

combining and applying innovative yet simple products and processes concurrently throughout various departments including engineering, fabrication shops, and production stages of construction. The application of this technology can achieve a significant reduction in man-hours and construction lead times in the area of foundations and hangering systems.

NSRP 0538 (N4-95-1)

Design for Production Manual, 2nd Edition

University of Washington, University of Newcastle upon Tyne

The overall objective of design for production can be defined as "Design to reduce production costs to a minimum compatible with the requirements of the vessel to fulfil its operational functions with acceptable safety, reliability and efficiency." The manual will be of use to everyone involved in the shipbuilding process, but is aimed particularly at designers, planners, production engineers and those responsible for improving design/production integration. This second edition updates the first (NSRP 0236, published in 1985).

Shipbuilding Pictures Database

Another useful resource available on the Internet is the NSNet Shipbuilding Pictures Database. The database is designed to make high-quality production-related photographs readily available to the maritime community. The photographs have been selected from the collection of Mr Louis D Chirrillo and provide a wide range of illustrations of modern shipbuilding practice as well as many historical images. It is well worth exploring and can be visited at `www.nsnet.com`

FROM THE CROW'S NEST

RINA/SNAME Agreement

The Royal Institution of Naval Architects and the Society of Naval Architects and Marine Engineers have recently signed an agreement for closer co-operation between the two institutions. One of the immediate consequences of the agreement is that publications of each institution are available to members of the other institution at member prices.

The World's Largest Shipping Power

Greece is the world's largest shipping power, according to a report in the Geneva-based *Journal of Commerce*. The Greek merchant fleet has a capacity of 123.8 million tonnes, representing 17.6% of the world's total. To maintain its position, Greece has opened a new marine academy in Hania, Crete, which is part-funded by the European Union. [*Engineering World*, Oct/Nov 1999]

Tholstrup Completes Epic Darwin-to-Japan Voyage

Darwin to Japan by sea is a long trip for any mariner, but when you do it in a 5.4 m trailer boat powered by a single 90 hp four-stroke motor, the odds against survival, let alone success, would seem insurmountable. But Danish-born Australian adventurer, Hans Tholstrup has done it.

Tholstrup used stock standard equipment for his voyage, and not very much of it at that. He chose a 5.4 m Haines Signature 540C which had its fuel capacity boosted to 250 L and foam flotation jammed into every available crevice. Three electric and two manual bilge pumps were added.

He powered the boat with a standard 90 hp Honda four-stroke engine, backed up with a 5 hp Honda four-stroke which was never required. 3100 L of fuel were used on the voyage.

Key equipment on a smaller scale were two hand-held GPS units, a Kyocera satellite phone which could operate from anywhere in the world, a VHF radio and a Para sea anchor which Tholstrup describes as his life saver.

Those who tire after a short stint at the wheel will also be interested to know that Tholstrup shunned the use of an auto-pilot, steering the boat by hand for the entire trip of over 4000 n. mi. [*Sydney Afloat*, Aug 1999]

World Water Speed Record Update

Ken Warby's new boat, in which he plans to raise the world water speed record, is in the paint shop getting a final coat of white paint, and when it comes out it will be ready to run. Ken is currently talking to potential sponsors about sponsorship options. There is nothing firm yet, but he is hopeful of signatures soon.

The realistic date for testing, and promotional runs for the sponsors, is mid-2001, with the record runs in September/October 2001.

The latest pictures of the vessel (and many other details) are on Michael Tait's Official Australian website `www.kenwarby.com`.

TECHNICAL PAPER

Progress in the Prediction of Squat for Ships with a Transom Stern

Lawrence J Doctors
The University of New South Wales

Abstract

The inviscid linearized near-field solution for the flow past a vessel with a transom stern is developed within the framework of classical thin-ship theory. However, the hollow in the water behind the stern is represented here by an extension to the usual centreplane source distribution employed to model the hull itself. As a consequence, the resistance, sinkage, and trim can be computed by means of an integration of the resulting pressure distribution over the wetted surface of the vessel. Comparison of the theoretical results with towing-tank data shows excellent correlation.

1. Introduction

Previous work on the subject of prediction of resistance of marine vehicles, such as monohulls and catamarans, has shown that the *trends* in the curve of total resistance with respect to speed can be predicted with excellent accuracy, using the traditional Michell (1898) wave-resistance theory.

These principles were advanced in the research of Doctors and Day (1997). There, transom-stern effects were included in the theory by accounting for the hollow in the water behind the vessel in an approximate manner. The wave resistance was assumed to be simply that of the vessel plus its hollow in the water behind the transom. To this drag they added the so-called hydrostatic resistance, which represents the drag associated with the transom stern not being wetted. A good level of correlation between the predictions and the experimental data for a large set of conditions for the tests on a towing-tank catamaran model was demonstrated.

In the current work, we will show the results of computation of the near-field solution to the flow using an extension to the classical thin-ship approximation. This idea clearly represents a considerable addition to the complexity of the solution which contrasts with the traditional far-field method whose origins lie in the pioneering research of Michell.

2. Mathematical Formulation

Figure 1(a) shows the main geometric features representing a typical hull. The hollow that is developed in the water behind the transom stern is also depicted. A regular meshing, consisting of flat panels or “facets” possessing a rectangular base, is employed for the purpose of the numerical calculation of the pressure, or profile, resistance. This type of panel is algebraically simpler than the “pyramids” or “tents” which have been previously

employed. The use of flat facets implies a higher level of discontinuity on the hull surface. On the other hand, numerical convergence tests for wave resistance, based on the two types of panels, showed that a similar number of panels was required in either case; namely, 40 panels in the longitudinal direction and 8 panels in the vertical direction.

The solution for the potential flow past the hull of the ship is based on a Kelvin point source which was obtained by Wehausen and Laitone (1960). This rather complicated mathematical expression can be integrated for a constant-strength source panel and a constant-slope field panel in the so-called Galerkin manner. The details of this procedure are similar to those outlined by Doctors and Beck (1987), where special wave functions were developed for this type of analysis. The purpose of this stage of the work is to perform as much of the development of the procedure analytically as is possible, thus making the computer program very efficient.

It is possible to obtain relatively simple expressions for the velocity induced over the surface of the hull of the vessel and also on the surface of the hollow developed behind the transom stern. Considerable gains in efficiency are also obtained by using a uniform mesh as shown in Figure 1(a), since many of the calculations are repetitive. As a consequence, the computer program can be coded to take advantage of this characteristic.

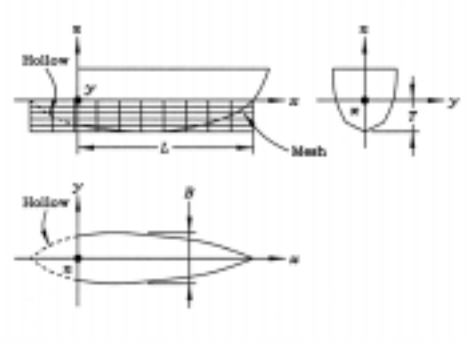


Figure 1: Definition of the Problem
(a) Fitting Mesh to the Vessel

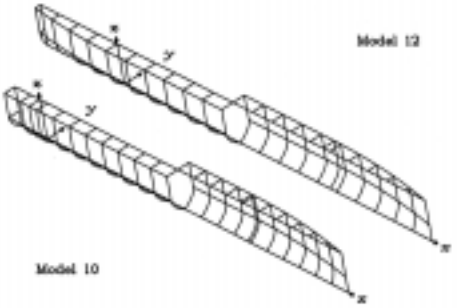


Figure 1: Definition of the Problem
(b) Lego Model 10 and Model 12

The next stage is to determine the pressure on the surface of the hull through the Bernoulli equation. The forces and moments acting on the vessel are then found from this resulting pressure distribution. Initially, the vessel will not be in equilibrium. Numerical experiments showed that using the traditional *hydrostatic stiffness* coefficients worked well for iterating the sinkage and trim of the vessel. The typical number of iterations to find the equilibrium of the vessel to a high degree of accuracy was between five and nine. The resulting computational time for the hydrodynamics of the vessel in a chosen condition of displacement, initial trim and speed, is only a few seconds.

3. Towing-Tank Experiments

The twelve so-called Lego towing-tank ship models were described by Doctors (1998). These models were constructed from up to seven segments and this allowed great freedom in creating a large number of systematic variations. The philosophy behind the models is that of the original Wigley simple ship. The bow and stern segments had parabolic

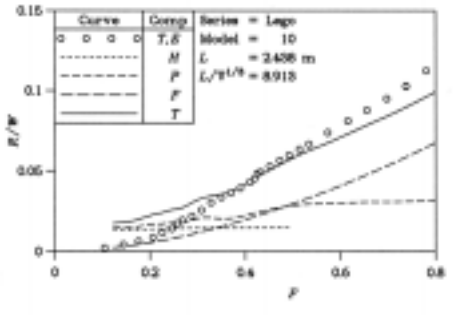


Figure 2: Resistance Components
(a) Lego Model 10

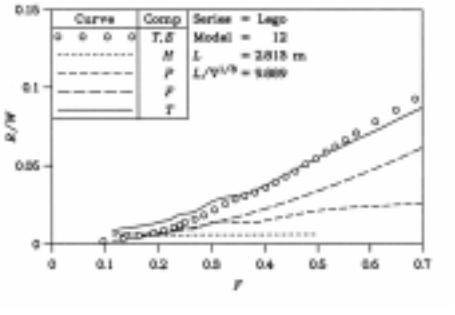


Figure 2: Resistance Components
(b) Lego Model 12

waterplanes. The bow segments, stern segments, and the parallel middle-body segments all possess parabolic cross sections. Figure 1(b) shows pictorial views of two of the test models. Each model had a beam of 0.150 m and a draft of 0.09375 m. Model 10 had a length of 2.4375 m and a prismatic coefficient of 0.8957. Model 12 had a length of 2.8125 m and a prismatic coefficient of 0.8735.

Experimental measurements included the resistance, sinkage, and trim of the model, during a large number of constant-speed tests.

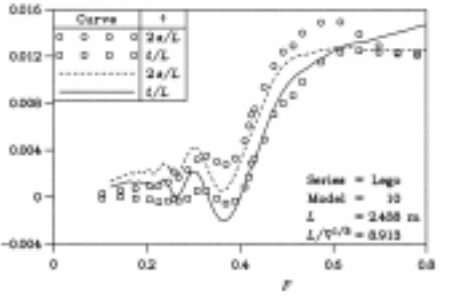


Figure 3: Sinkage and Trim Predictions
(a) Lego Model 10

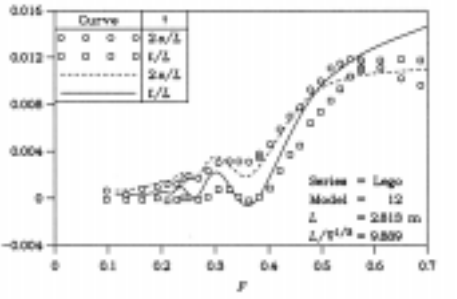


Figure 3: Sinkage and Trim Predictions
(b) Lego Model 12

4. Numerical Results

Figure 2 shows the resistance components for the two models. The curves show respectively the total-experimental, low-speed hydrostatic, pressure, frictional, and total-theoretical resistance, as functions of the Froude number. The calculations include the effects of sinkage and trim and employ the near-field theory. One sees that the total-theoretical resistance correctly approaches the theoretical hydrostatic resistance at sufficiently low speeds. Of course, the theory ignores real-fluid effects of a partially filled transom hollow; hence the total-theoretical resistance overestimates the total-experimental resistance at low speeds. The correlation could no doubt be improved at higher speeds by employing a form factor to the 1957 International Towing Tank Committee (ITTC) formula for the frictional resistance.

Finally, we present a comparison for the dimensionless sinkage and the dimensionless trim in Figure 3. Remarkably good agreement is demonstrated for both Model 10 and Model 12.

5. Conclusions

Future research should be directed towards a refinement of the model detailing the precise shape of the transom-stern hollow. Details of the numerical procedure can also be improved, particularly by establishing a data bank of near-field influence functions.

6. Acknowledgments

The author would like to thank Mr M Grimm, Directorate of Naval Platform Systems Engineering, Department of Defence, for his support through Contract 9627MZ. He gratefully acknowledges the assistance of the Australian Research Council (ARC) Large Grant Scheme (via Grant Number A89917293). He is also appreciative of Mr G Macfarlane, at the Australian Maritime College in Launceston, who was responsible for supervising most of the experimental testing.

7. References

Doctors, L J: "Prediction of Resistance for Ships with a Transom Stern", *The Australian Naval Architect*, Sydney, Australia, Vol. 2, No. 2, pp 26–33 (July 1998).

Doctors, L J and Beck, R F: "Convergence Properties of the Neumann-Kelvin Problem for a Submerged Body", *J. Ship Research*, Vol. 31, No. 4, pp 227–234 (December 1987).

Doctors, L J and Day, A H: "Resistance Prediction for Transom-Stern Vessels", *Proc. Fourth International Conference on Fast Sea Transportation (FAST '97)*, Sydney, Australia, Vol. 2, pp 743–750 (July 1997).

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

Wehausen, J V and Laitone, E V: "Surface Waves", *Encyclopedia of Physics: Fluid Dynamics III*, Flügge, S (Ed.) Springer-Verlag, Berlin, Vol. 9, pp 445–814 (1960).

TECHNICAL PAPER

Typographical Corrections for Three Recently published Regression based Resistance Prediction Methods

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This brief article corrects several typographical mistakes which have appeared in three recently-published regression-based resistance prediction algorithms. The subject papers have described methods for the prediction of added resistance in waves (Leibman *et al.*1990) and the prediction of calm-water resistance for medium- to high-speed displacement monohulls (Fung and Leibman 1993, and Fung and Leibman 1995).

The corrections summarised in this article have been prepared with the assistance of the authors of the original papers. The figures presented in this article are intended to demonstrate that the calculated values of the corrected coefficient and equations match the examples given in the original publications. This article does not attempt to discuss the suitability of any of the three methods for any application. The coding and discussion of the applicability of the methods are documented in Peacock *et al.*(1997). The list of corrections have been approved by the authors of the original papers.

Paper 1 Leibman *et al.*(1990)

Leibman *et al.* (1990) presented a method for the estimation of the added resistance in waves during the early stages of design. In this 'engineering'-based approach the added resistance in waves is estimated at different speed length ratios, $V/\sqrt{L}$, for a discrete set of modal frequencies, T_m. In the original publication a typographical error exists in the 'c' regression coefficient for the $V/\sqrt{L} = 0.8$ and $T_m = 7$s combination. The coefficient was printed as -1.2712e+4. However, it should have been printed as -1.2712e+5. Using the corrected coefficient for the MHC example[1] the results listed in Table 1 are obtained[2].

Paper 2 Fung and Leibman (1993)

At The Society of Naval Architects and Marine Engineers, Chesapeake Section meeting in 1993 a speed-dependent method for the estimation of calm-water resistance of high-speed

transom-stern hullforms was presented by Fung and Leibman (1993). This method required the prediction of a residuary resistance coefficient. The reader is referred to the actual publication for the usage and a detailed explanation of the method. The corrected formulae for the estimation of the residuary resistance coefficient[3], C_R, are as follows:

$$C_R = \exp\left\{\sum_{i=0}^{63}\left[B_i \prod_{j=1}^{9}\left(x_j^{c_{ij}}\right)\right]\right\}$$

where

$$x_2 = \cos\left(\lambda F_n^e\right)\exp\left(\frac{a}{F_n^2}\right)$$

$$\lambda = a_1 C_p + 0.034977 a_2 \mathrm{DL}$$

In the original publication the λ term, which is used in the calculation of x_2, contained an error. The error was identified after inspection of Figures 4.5 to 4.7 in the original publication. The remaining coefficients, a, a_1, a_2, d, e, B_i, c_{ij}, x_1 to x_9 are as published.

A comparison of the results produced using the published equation, the corrected equation and the results of the published example for the method of Fung and Leibman (1993) is shown in Figure 1. From comparison of the corrected equation for the residuary resistance coefficient in Figure 1(a) and the total resistance in Figure 1(b) it can be seen that the corrected equation provides good agreement with the published example.

Paper 3 Fung and Leibman (1995)

In a revised paper at FAST '95 Fung and Leibman (1995) presented an extended method for the prediction of calm-water resistance for high-speed transom-stern hullforms. This method extended their earlier publication (Fung and Leibman 1993), as it increased the database of tested hull-forms to include more hullforms of the medium-speed patrol craft type. The corrected formulae for the estimation of the residuary resistance coefficient[4], C_R, are as follows:

$$C_R = \exp\left\{\sum_{i=0}^{69}\left[B_i \prod_{j=1}^{9}\left(x_j^{c_{ij}}\right)\right]\right\}$$

where

$$x_2 = \cos\left(\lambda F_n^e\right)\exp\left(\frac{a}{F_n^2}\right)$$

$$\lambda = a_1 C_p + 0.034977 a_2 \mathrm{C}_p \, \Delta / \left(L_{wl}/100\right)^3$$

The remaining coefficients, a, a_1, a_2, d, e, B_i, c_{ij}, x_1 to x_9 are as published.

A comparison of the results produced using the published equation, the corrected equation and the results of the published example for the method of Fung and Leibman (1995) is shown in Figure 2. From comparison of the corrected equations for the residuary resistance coefficient in Figure 2(a) and the total resistance in Figure 2(b) it can be seen that the results again provide good agreement with the published example.

Acknowledgements

The assistance and permission of the authors of the original papers is acknowledged. Without their kind assistance this list of corrections would never have eventuated.

The authors would like to acknowledge the financial and in-kind support of the Australian Maritime Engineering Cooperative Research Centre and its participants who funded this review.

References

Fung, S C and Leibman, L:, "Statistically-Based Speed-Dependent Powering Predictions for High-Speed Transom-Stern Hull Forms", *Proc. Chesapeake Section Meeting, The Society of Naval Architects and Maritime Engineers*, 71+viii pp (1993).

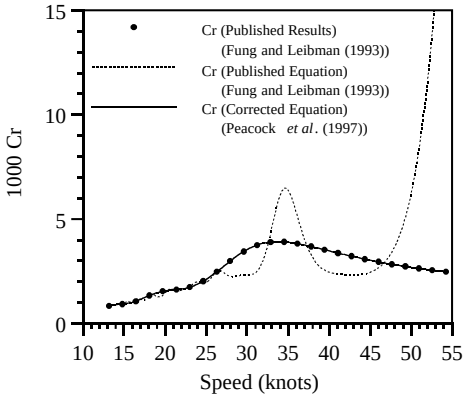
Fung, S C and Leibman, L:, "Revised Speed-Dependent Powering Predictions for High-Speed Transom Stern Hull Forms", *Proc. Third International Conference of Fast Sea Transportation (FAST '95)*, Lübeck-Travemünde, Germany, Vol.~1, pp 151-164 (1995).

Leibman, L, Fung, S C and Slager, J J:, "An Engineering Approach to Prediction of Added Resistance in Waves During Early Stages of Ship Design", *Proc. Chesapeake Section Meeting, The Society of Naval Architects and Maritime Engineers*, 107+viii~pp (October 1990).

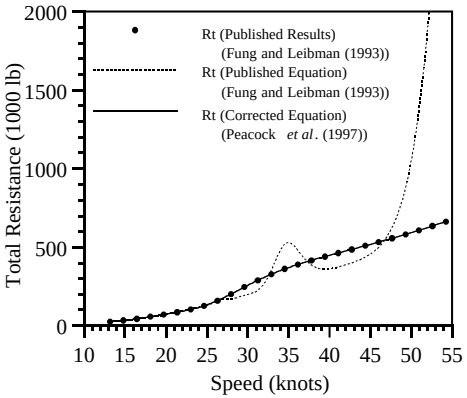
Peacock, D, Smith, W F. and Pal, P K:, "Correction to the Published Resistance Methods of Fung and Leibman (Commercial-in-Confidence)", Australian Maritime Engineering Cooperative Research Centre, Launceston, Australia, AMECRC IR~97/2, 25 pp (1997).

Table 1
Corrected Equation Results for MHC Example

		$V/\sqrt{L}$	
	0.80	**1.00**	**1.20**
T_m **(s)**	R_{AW} **(lb)**	R_{AW} **(lb)**	R_{AW} **(lb)**
500	213 660	171 042	136 192
700	261 816	288 885	323 710
750	224 127	248 045	288 568
900	135 256	139 665	164 186
1 100	82 701	78 813	88 489
1 300	56 554	51 656	56 935
1 500	36 975	34 691	37 946
1 700	25 348	23 633	25 517
1 900	17 596	16 406	17 409



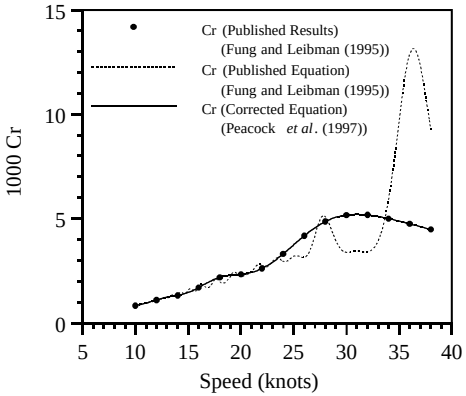
(a) Residuary Resistance Coefficient



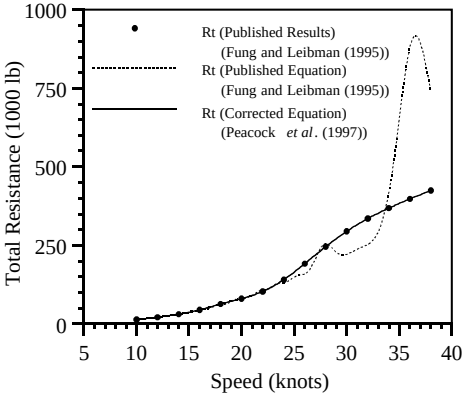
(b) Total Resistance

Figure 1

Results for Fung and Leibman (1993) Example



(a) Residuary Resistance Coefficient



(b) Total Resistance

Figure 2

Results for Fung and Leibman (1995) Example

End Notes:

1. The bounds on the example input data do not satisfy the published valid range for the method. The example violates the L, C_{wp} and C_x constraints.

2. The numerical results obtained when using the method will differ slightly from those published in the orignal paper due to the fact that the published coefficients were rounded to six significant figures. The published examples were calculated using the full precision of the derived coefficients.

3. The equations are presented here using the nomenclature of Fung and Leibman ('93).

4. The equations are presented here using the nomenclature of Fung and Leibman ('95).

AUDIT REPORT ON DEFENCE PROCUREMENT

In October this year the Auditor General presented to Parliament the Australian National Audit Office report (No. 13 1999-2000) entitled *Management of Major Equipment Acquisition Projects*. The report stated that: "The audit arose largely from concerns expressed by the Parliamentary Joint Committee of Public Accounts and Audit (JCPAA) during its reviews of the audit reports on the $1 billion JORN project and the $5 billion New Submarine Project. Those audit reports had commented on the need for Defence to improve its risk management of the projects, take firm and prompt action with the contractors to resolve contractor performance and quality issues and to pay only for achieved progress. The audit objective was to assess Defence's arrangements for higher-level management of major equipment acquisition projects. The principal aim was to formulate practical recommendations that would both enhance Defence's management of major acquisition projects and provide a degree of assurance about its ongoing apparent capacity to do so efficiently and effectively."

In its conclusions and recommendations the report stated:

"9. Management of acquisition projects in Defence is a complex task that relies on sound planning, DAO, programming, budgeting and implementation activities within at least four functional groups - ADHQ, the relevant Service and SCA. The size and nature of the acquisition activity have no comparison in the Southern Hemisphere. As such, to maintain an effective acquisition activity, Defence in effect seeks to be a leader in the development of its acquisition management activities.

10. Overall management of acquisition projects has, however, experienced systemic problems arising from a traditional top-down management of Defence's various functional groups without effective lateral communication and other processes by which capability outcomes can be managed better. Defence groups have often had a limited perspective on decisions that may affect other Defence groups further along the capability management continuum. For example, tasks such as maintaining a balanced view of capital expenditure and recurrent costing are often hampered by inadequate life-cycle cost estimates. As well, views about the practicability and/or clarity of acquisition objectives are not always shared by those concerned. Consequently, Defence and the ANAO see scope for improving Defence's arrangements for higher-level management of major acquisition projects and the efficiency and effectiveness of the acquisition function.

11. Defence has relied on committees to try to achieve suitable coherence and integration between the functional groups that contribute to capability management. However, given the increased numbers of functional groups (now 12) and the increasing complexity of capability management tasks, reliance on committees needs to be balanced against the advantages that could accrue from strong lateral management processes underpinned by modern business management practice, including a supportive information infrastructure.

12. Management information systems and performance monitoring systems that view capability management as a continuum across several functional groups have not yet been sufficiently developed to support sound decision-making. Consequently, Defence has still to implement key performance indicators and benchmarks covering *all* aspects of capability management. Defence is seeking to improve its capability management processes so that it may better manage capability planning, programming and budgeting, acquisitions and in-service support. However, given the absence of appropriate output management systems and agreed key performance indicators, any objective measurement of process improvements over time maybe some years off.

13. Despite the large investment in capital equipment acquisitions recent decades, Defence has not yet established the career structures it requires to be reasonably self-reliant in developing suitably experienced professional project managers who know and understand the Defence environment including capability outcomes. DAO remains reliant to a large extent on ADF officers posted-in from the Services as project managers and on increasing numbers of contracted-in professional service providers.

14. The Defence Executive's initiative of seamless management of Defence capability combined with the Government's accrual-based budgeting outcomes and outputs framework should, if properly implemented enhance the focus on performance and accountability by providing a more effective basis for stronger project management of major acquisitions. However, much will still depend upon Defence's capacity to further develop and maintain a corps of skilled, knowledgeable and experienced acquisition professionals within DAO and in other parts of the Defence capability management continuum.

15. The effective management of major acquisition projects is a business-critical function for the depart-

ment and warrants the ongoing involvement of the Defence Executive to progress, and build on, the initiatives for improvement currently under way.

16. This audit report makes six recommendations that aim to reinforce changes now underway in Defence. The recommendations propose that Defence:

- reconsider the benefits of allocating budgets for Defence's capability outputs to the relevant Output Managers, who, in turn, would fund the functional Groups through purchaser-provider agreements, when internal financial and costing systems permit such an approach;

- seek approval for cost-effective annual budget carry-overs to support project managers in adopting a more commercial approach and paying contractors for achieved value for money, thereby reducing any incentive for managers to expend funds for the purpose of utilising annual budget allocations;

- provide for project managers to produce regular reports in a format that gives an objective overview of progress on major acquisition projects for review by senior managers; provide Output Managers with authority, in accordance with agreed protocols, to intervene in project management when appropriate and to implement contingency measures in response to adverse variations from approved schedule, cost or quality; and provide exception reports to senior executives to allow consideration of contingency plans where progress has not proceeded according to requirements; reinforce and support initiatives to develop a standard project management method across all functional Groups involved in major equipment acquisition; align equipment acquisition project team focus with customer needs by making Project Boards accountable to the Output Manager responsible for delivering the output; and maintain an up-to-date DAO personnel workforce plan, in consultation with Output Managers, that integrates better current workforce initiatives and manages workforce demographics to increase the availability of experienced project managers."

The full text of the report is available on the internet at `www.anao.gov.au`.

INDUSTRY NEWS

Sale of ADI Limited

On 2 November 1999 the Minister for Finance and Administration and the Minister for Defence announced that the Commonwealth and Transfield Thomson-CSF Investments Pty Limited, a joint venture company beneficially owned by the Transfield Holdings Pty Limited group and the Thomson-CSF group, had executed a contract for the sale of the Commonwealth's shares in ADI Limited.

The negotiated price for the Commonwealth's shares is $346.78 million. The Ministers stated that the Government was extremely pleased with the outcome of the ADI sale process and was confident that the joint venture is well placed to build on ADI's strengths and standing within the Australian defence industry through access to new technology, management skills and capital resources.

The joint venture, which brings together two corporations with complementary skills and experience with the dual benefits of significant Australian involvement and access to world-class defence technology, plans to ensure that ADI is better positioned to provide enhanced and more efficient products and services for the benefit of its customers and the Australian defence industry generally.

The joint venture has indicated its commitment to the continued operation of ADI's existing core businesses at their current locations. In particular, it is expected that ADI's operations at Albury, Bendigo, Benalla, Lithgow, Mulwala and Newcastle will continue and, where commercially possible, be strengthened by the development of new business activities, presenting opportunity for regional employment.

ADI's three development properties were not included in the transaction. These have been transferred to the ComLand Limited group of companies, which are wholly owned by the Commonwealth.

Final settlement of the transaction is expected around the end of November at which time the joint venture will assume ownership and full operational control of ADI Limited. Consistent with usual commercial practice, there will be an adjustment to the purchase price at completion reflecting any changes to the net asset position of ADI's business from 1 July 1999.

The new Managing Director of ADI Limited is Mr Jean-Georges Malcor. Mr Malcor has seven years experience in the defence industry in Australia as Managing Director of Thomson Marconi Sonar Pty Limited and was formerly with Thomson Sintra Pacific Pty Limited. The Chief Financial Officer will be Mr Peter Francis, who joined Transfield in 1971.

Forgacs acquires Cairncross Dock

The scope of the ship repair activities of the Newcastle-based company Forgacs was expanded in July with the acquisition of the Cairncross Dock ship repair operation in Brisbane. The previous operators of the dock, Keppel Cairncross Pty Ltd went into voluntary administration in January this year.

The Cairncross Dock is the second-largest graving dock in Australia, after the Captain Cook Dock in Sydney. It is 263 m long by 32.5 m wide and is served by one 50 t and four 5 t cranes. An adjacent 307 m long wharf is fitted with a 30 t crane.

With this acquisition, and its existing facilities in Newcastle and Gladstone, Forgacs is now one of the largest ship repair companies in Australia.

Night work in Cairncross Dock

NINE NEW POLICE BOATS FOR NEW SOUTH WALES

Western Australian shipbuilder Image Marine, an Austal Group company, has won a contract to supply nine new-generation police boats for the New South Wales Police Service, Water Police Branch.

The contract comprises two 22 m vessels (Class 1) and seven 16 m vessels (Class 2) which are scheduled to join the NSW Water Police fleet in time for the Sydney Olympics.

The new aluminium police boats will replace many of the existing vessels in the Police fleet and are set to significantly enhance water policing capabilities and marine search and rescue along the NSW coast and 200 nautical miles out to sea (to the edge of the Exclusive Economic Zone). The 16 m vessels will be based in Coffs Harbour, Port Stephens, Newcastle, Broken Bay, Sydney, Sans Souci and Port Kembla, with the two 22 m monohulls joining the 16 m vessels in Coffs Harbour and Sydney.

The monohull boats, designed by Image Marine, are intended to be durable and flexible in their operation with excellent seakeeping qualities.

With an operational speed of approximately 28.5 kn, the Class 1 and Class 2 vessels will combat marine criminal activities, undertake general policing duties and will also offer support in Sydney during the Olympic Games.

On-board features include specialised electronics equipment, crew accommodation suitable for short periods of time (two twin-berth cabins for the16 m vessels and three twin-berth cabins for the 22 m vessels), a fully equipped galley, crew mess, first aid facilities and adequate operational space. Each vessel also features dive platforms and storage space for diving equipment. An additional feature of the 22 m vessels is a 4.5 m semi-rigid daughter vessel which can be launched off a stem ramp and used for general transport and patrol purposes.

16 METRE POLICE BOAT

Principal Dimensions

Length OA	16.0 m
Length WL	14.30 m
Overall beam	4.90 m
Draught	1.20 m
Speed	28.5 kn
Range	400 n. mi. @ 18 kn
Total Crew	4
Engines	Two Scania D1 12 42
Gearbox	Two Twin Disc Mg 5114 1A
Propellers:	Two Teignbridge Aquaquad/quin

22 METRE POLICE BOAT

Principal Dimensions

Length OA	22.0 m
Length WL	17.40 m
Overall beam	5.50 m
Draught	1.50 m
Speed	28.5 kn
Range	600 n. mi. @ 18 kn
Total Crew	6
Engine	Two MAN D2842 LE408
Gearbox	Two ZF BW155
Propellers	Two Teignbridge Aquaquad/quin

SOME MARINE CASUALTIES
EXERCISES IN FORENSIC NAVAL ARCHITECTURE
(PART 4)

Robert J Herd

9. CAPSIZE OF MV *STRAITSMAN*

Straitsman was a stern-loading roll-on/roll-off motor vessel with an overall length of 205 feet, gross tonnage of 720 tons and net tonnage of 194 tons. She was propelled by twin screws, which were bridge controlled. Her maximum speed was about 12 knots.

She was completed in January 1972 by North Queensland Engineers and Agents Pty Ltd (NQEA) at Cairns to the order of R H Houfe & Co. Pty Ltd. She operated under that ownership until September 1972, then was laid up for about twelve months. Subsequently she was owned and operated by the Tasmanian Transport Commission.

The stern door was of guillotine type, about 13 feet high and 20 feet wide, operated from the boat deck by an electric winch which lifted and lowered the door by a cable and pulley arrangement. The door was constrained to move vertically by slides on either side and when lowered was made watertight by the application of dogs in the vehicle deck.

From September 1973 she was engaged in carrying livestock and miscellaneous cargo between the ports of Stanley, Grassy (King Is.) and Melbourne.

On 22 March 1974 *Straitsman* sailed from Grassy about 6.45 pm bound for Melbourne carrying a cargo of livestock and miscellaneous goods totaling 510 tons. About 1,270 sheep weighing some 57 tons were loaded on the upper deck, while about 900 sheep weighing about 40 tons were loaded in the lower hold. On the vehicle deck was about 385 tons of miscellaneous cargo with a forklift truck of about 22 tons and a drilling rig of about 25 tons. A small forklift weighing about 6 tons was carried in the lower hold.

On leaving Grassy the cargo was well lashed and the sheep penned to prevent movement amongst them. The fore peak and after peak ballast tanks, Nos. 1 and 3 double-bottom ballast tanks port and starboard were pressed up. The oil fuel tanks, i.e. Nos. 4 and 5 double-bottom tanks were all full, No. 4 port tank being in use. Of the freshwater tanks, i.e. No. 2 double bottom tank port and starboard, the port tank was full and the starboard tank in use and therefore slack.

The bilges had not been sounded on departure from Grassy, or during the voyage. The Mate, in conjunction with the Master, checked stability before and after loading at Grassy finding an effective GM of 2.31 feet. As this was determined on a conservative basis, it was estimated that the actual GM was in excess of 3 feet. The vessel therefore had ample stability on departure from Grassy. Various views were expressed about the freeboard in way of the stern door, but it is likely that this was of the order of 11 inches.

During the voyage, which was calm and uneventful, some 900 gallons of fuel were transferred from No.4 port double bottom tank to the forward daily service tank. In all other respects the condition of the vessel was unchanged.

At about 6.30 am on 23 March 1974, the crew were called to prepare for berthing at No. 14 South Wharf in the Yarra River and at about 6.50 am the vessel proceeded to enter the river. About the same time the Duty Engineer, the Cook and the Steward assembled on the after end of the poop deck for a cup of coffee and a smoke while two of the seamen went into the vehicle deck to unlash the cargo prior to discharge. A third seaman went below about 7.00 am and commenced to unbolt or “soften up” the stern door. It would seem that by 7.10 am the unlashing of the cargo and the “softening up” of the stern door had been completed. At about the same time,

with the vessel approaching the Holden Swinging Basin and still being in a normal and stable condition, the group on the poop deck broke up to go to their duty stations.

Within six or seven minutes the vessel had completely capsized and veered to starboard, coming to rest in 40 feet of water across the river in a position adjacent to Swanston Dock. The vessel had gone from being completely stable to one of loss within about one quarter of a mile and within about two minutes. Once the stern door had been "softened up" one seaman proceeded to the Boat Deck and raised the stern door. There is some doubt as to whether water entered the vehicle desk immediately or within a very few minutes. There was some evidence that water washed over the after end of the vehicle deck beyond the stern door during normal operations. The inflow of water was probably assisted by an increase of speed since the vessel slowed down when passing other ships in the river and then accelerated.

When it became evident to the winch operator on the Boat Deck that water was entering the vehicle deck in increasing quantities as the vessel heeled, an unsuccessful attempt was made to lower the door. Due to the heel the door would not traverse its guides. As a result of the influx of water, the vessel lost stability, listed to port and sank on her port side after sheering to starboard. As a result of the sheer, the bow of *Straitsman* came very close to the bow of *Dilkara* which was moored at No. 32 South Wharf.

Immediately prior to sinking the engines had been stopped and then put full astern but to no avail. Two of the crew lost their lives, the Third Engineer who had come off watch at 4 am and was asleep in his cabin and the helmsman at the time of capsize. Only the Third Engineer's body was recovered.

Much evidence given was devoted to questions of practice in unlashing and softening up the stern door prior to berthing. The habit of opening the stern door prior to berthing as used in other roll-on roll-off vessels was quoted in defense. The Court took the view that this was "slipshod practice" and should be forbidden by standing orders.

After salvage *Straitsman* operated satisfactorily for an extended period of time.

10. THE BROACH AND CAPSIZE OF MFV *SHARK*

MFV *Shark* was a steel, multi-chine fishing vessel of 58 feet length overall, breadth moulded 15 feet 6 inches, least moulded depth 7 feet 3 inches and draught 5 feet 6 inches. It was designed in 1958 by Mr Alan Payne who sold the plans to a builder. The vessel was not built under Mr Payne's supervision.

In 1971 when operating as a prawn trawler in Melbourne she was bought by an owner in Lakes Entrance. At the time of loss she was engaged in shark fishing in Bass Strait.

On the morning of 18 March 1978, *Shark* recovered some shark nets east of Lakes Entrance and then headed for home. Earlier a south-easterly wind had sprung up and by early afternoon the wind was blowing at Force 6, building up considerable seas and making the crossing of the bar hazardous.

The vessel had a crew of two, in addition to the master. The master was nervous about crossing the bar in the prevailing conditions — waves probably averaging 10 feet or more in height and he consulted skippers on nearby vessels and others by radio. The owner, himself an experienced fisherman, gave him advice on preparing the vessel and on stowage of gear and equipment. He was advised by other skippers he consulted that the bar could be negotiated with care.

The dredged channel through the sandbank was aligned slightly west of north. There were two options usually adopted for entry. Each involved approaching outside the line of the breakers. One was to then turn in line with the channel and enter on the leads. The danger in this approach was that before the starboard turn could be completed the vessel could be carried onto the western bank (spit) by the sea.

The other alternative was to cut across the eastern bank and turn to starboard into the channel lining up on the leads. It was prudent to wait outside the breakers, observe the run of the sea, wait for a lull and cross the bank keeping the stern square on to the waves.

The skipper of the *Shark* indicated by radio that he would steam past the point where, in fine conditions it would be appropriate to turn to starboard, assess the situation and then make his entry appropriately.

The loss of the *Shark* was somewhat unusual in that it was observed by a number of fishing boat skippers. Some were positioned at Jimmy's Lookout, on the hill leading into Lakes Entrance from Melbourne, which overlooked the channel. Apparently it was customary to observe vessels entering when conditions were rough. Additionally, another skipper, his wife and son were observing with binoculars and telescope from their home on a hill, which also overlooked the channel.

The *Shark* did not steam past the channel and observe conditions, but when the vessel was east of the proper course for entry it was observed to turn and cross the eastern bank, not with the waves square astern but on the starboard quarter. Some of the observers considered that the vessel was too close to the line of breakers when she turned to starboard to make her run, others thought the distance was sufficient.

The vessel was seen to run fast down the face of a large wave without getting the sea square astern. As the bow ran into the trough, the vessel broached violently to port, heeling heavily to starboard. The turn to port was such that the bow started to come back up the face of the wave. The crest of the wave hit the vessel almost broadside and either that wave or the next one rolled the vessel upside down as it was being carried across the channel to the western spit where it came to rest upside down.

None of the three men on board were seen by those watching to escape. In past incidents on the bar crew had been washed below decks by the inrush of water and had subsequently escaped from their confinement. Conditions following the capsize prevented anyone climbing onto the hull to knock for a response or diving down to investigate till some time later. About twenty minutes after capsize, the vessel turned onto its side and pounded on the bottom when a quantity of air and debris was expelled from the interior. No crew were sighted. At this point it was evident that the deckhouse had been removed from the vessel while upside down. Subsequently the bodies of the three men were found, some two kilometres away and one tangled in the nets which had spilled from the hull amidships.

The vessel following *Shark* lay outside the breakers for some 20 minutes and then entered without difficulty.

The descriptions of the entry of *Shark* and its subsequent behaviour in the breakers were consistent with the well-known phenomenon of a broach, with or without subsequent capsize, in following or quartering seas. While this phenomenon is well treated in nautical and technical publications, the action to be taken in any particular situation, as evidenced by the unfortunate history of *Shark*, must rest on the judgement and expertise of the man in control on the spot.

REFERENCES

1. Australian Department of Transport, MV *Straitsman* (ON 344008), Court of Marine Inquiry Report No. 155, Canberra, 1975.

2. Marine Board of Victoria, Marine Act 1958, Court of Marine Inquiry into a Casualty Constituted by the Loss of the Ship *Shark* on Lakes Entrance Bar within the Port of Gippsland Lakes on the 18th Day of March 1978.

HMAS *Balikpapan* off Dili, doing the job for which she was designed. HMAS *Success* in the background. (RAN Photograph)

NAVAL ARCHITECTS ON THE MOVE

This is a new column, intended to keep everyone (and, in particular, the friends you only see occasionally) updated on where you have moved to. It will consequently rely 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.

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

David Beresford has moved on from consulting as David Beresford Naval Architect and has joined Det Norske Veritas' Sydney office as a Plan Approval Surveyor.

Craig Gardiner has submitted his PhD thesis on *Corrosion of Bulk Carriers* at the University of Newcastle, and has taken up a position as a Research Scientist with the Maritime Platforms Division of the Defence Science and Technology Organisation in Melbourne.

Peter Gawan-Taylor has moved from design to a dual role in the marketing and initial design areas with Wavemaster International and retains the title of Design Manager.

Craig Hughes has moved on from Det Norske Veritas' Pusan office in Korea and has been re-located as Head of Section, Marine Services Centre, in their Shanghai office in the Peoples' Republic of China.

Daal Jaffers has moved on from Austal Ships and taken up a position with WaveMaster International as a naval architect.

Gavin Jones has moved on from Lloyd's Register's Yokohama office and has been re-located as Senior Plan Approval Surveyor in their Pusan office in Korea.

Geoff Leggatt has been promoted to the position of Production Design Manager with WaveMaster International.

Laurie Mayer has moved on from the Australian Maritime Safety Authority's Canberra office and is trying out their Mackay office. If he and the job like each other at the end of November, then he will stay on as the Surveyor for the ports of Mackay, Townsville, Abbot Point, Hay Point and Dalrymple Bay.

Scott McErlane has been employed by Lloyd's Register in London as a Plan Approval Surveyor for some time, and is due to complete his contract in early December. He will return to Australia for the ante-millennium fireworks and then join the current graduands beating paths to employers' doors.

Teresa Michell has moved on from the Waterways Authority of NSW and is consulting as Teresa Michell Maritime Solutions in Sydney. She is managing to combine naval architectural consulting with a significant amount of yacht-delivery consulting.

Dugald Peacock has received his PhD from UNSW for his thesis *Decision-based Hydrodynamic Design of Displacement Monohulls* and has taken up a position with the NRMA's Information Technology department at Lidcombe for a significant hourly contract rate.

David Pryce is supervising construction of the Graham Radford-designed IOOD50 yachts for the "Together Alone" round-the-world race being organised by Don and Margie McIntyre. Some readers will recognise Don and Margie as *Australian Geographic*'s couple who spent a year in the Antarctic at Cape Denison (see *AG* Oct/Dec 1996). They are now organising a yacht race with three divisions: Class I (solo) in IOOD50s, Class II (double-handed) in 13.7–15.2 m yachts and Class III (fully-crewed) in McIntyre 55s. Further information from their web-site `www.oceanfrontiers.com.au`.

Frank Ryan has moved on from Commercial Marine Design and has taken up a position with Austal Ships as a naval architect.

Mark Smallwood has moved on from Blohm and Voss Australia and has landed in those misty little islands off the coast of France, where he has been appointed Director, Professional Affairs, at RINA's head office in London.

Ian Stevens has moved on from Darwin Ship Repair and Engineering and shifted to Cairns. Like Clancy in Queensland, we don't know where he are. We will miss his cheerful, laconic style in providing news from the Northern Territory for the *ANA*.

Emma Tongue has moved on from WaveMaster International and taken up a position with Austal Ships as a naval architect.

Phil Helmore

MEMBERSHIP NOTES

Missing in Action

The RINA has temporarily lost contact with the following members, missing in action from the addresses given, but believed to be continuing the fight:

Mr G.A. Brunsdon, Norwood, Tas.;
Mr D.S. Clatworthy, Port Macquarie, NSW;
Mr C.A. Jesudasan, Launceston, Tas.;
Mr B.O. McRae, Launceston, Tas.; and
Mr S.K. Wilson, Rowville, Vic.

If anyone knows their current address, or where they went, or what they intended to do, then it would be appreciated if you would advise Keith Adams, Secretary of the Australian Division of RINA, on (02) 9876 4140, fax 9876 5421 or email kadams@zeta.org.au.

If you pull up your anchor, then your first priority should be to advise Keith Adams of your change of address so that we know where to send your next *ANA*.

AMERICA'S CUP 2000

The match races to decide the Louis Vuitton Cup, the trophy for the series to decide the challenger for the America's Cup, are under way in Auckland. The yachts entered are as follows:

Yacht	Yacht Club	Country
Abracadabra 2000	Waikiki	USA
AmericaOne	St Francis	USA
America True	San Francisco	USA
FAST 2000	Nautique de Morges	Switzerland
Le Défi BTT	Union National	France
Nippon Challenge	Nippon Challenge	Japan
Prada Challenge	Punta Ala	Italy
Spanish Challenge	Monte Real de Yates	Spain
Team Dennis Conner	Cortez Racing Assn	USA
Young America	New York	USA
Young Australia	Cruising Yacht Club	Australia

The schedule of races for the Louis Vuitton Cup is as follows:

Round Robin 1	8 October to 5 November
Round Robin 2	6 November to 1 December
Round Robin 3	2 December to 1 January
Semi-finals	2 January to 19 January
Finals	20 January to 13 February

The races for the America's Cup between the New Zealand yacht, *Team New Zealand*, and the winner of the Louis Vuitton Cup are scheduled for 14 February to 9 March 2000.

Full details of everything you ever wanted to know, but were too afraid to ask, are available on the web-site www.americascup.org.

Australia's 'economy' challenger, *Young Australia* during crew training trials on Sydney Harbour (Photo John Jeremy)

FROM THE ARCHIVES

The shape of Sydney ferries has changed considerably since this photograph of the brand new *Koompartoo* was taken as she lay alongside the Walsh Island Dockyard in Newcastle before hand over in 1922. She could carry 2,089 passengers and was designed for the Circular Quay–Milson's Point service. *Koompartoo* and her sister ship *Kuttabul* were the first new Sydney ferries built since 1914 and were the largest ever built for Sydney Ferries Limited.

After the bridge was opened in 1932, the large ferries were used on other routes. *Koompartoo* was modified as a concert boat in 1935 and *Kuttabul* had a flying bridge added over each wheelhouse to help her master see over the crowds when following the sailing on the weekends.

Kuttabul was sunk during the Japanese midget submarine attack on Sydney Harbour in 1942. *Koompartoo* had a much longer career. She was requisitioned by the British Ministry of Transport on 17 November 1941 and converted by Mort's Dock for service in the Middle East. The entry of Japan into the war kept her in the Pacific and she was transferred to RAN control in June 1942 and commissioned as HMAS *Koompartoo* on 23 December 1942. She served as a boom-gate vessel in Darwin from January 1943 to 1945, when she paid off into reserve. She was relocated to Sydney in 1950 and remained in reserve, mostly in Athol Bay, until sold in 1962. Her hull was towed to Launceston for use as a bauxite barge in 1966.

The General Manager of her builders in 1922 was Mr A E Cutler. When he retired in 1924 he was succeeded by Mr Arthur C Waters, who held the post until the yard closed. He became managing director of Hadfields Steel Works in 1939. Mr Waters joined the RINA in 1923 and remained a member until his death in 1979 aged 94. It is his bequest to the Australian Division of the RINA that has provided a continuing income for many years and enabled the Division to help with the education of young Australian naval architects.

Koompartoo in Athol Bay in 1962, alongside the frigate *Murchison*
(Photo John Jeremy)

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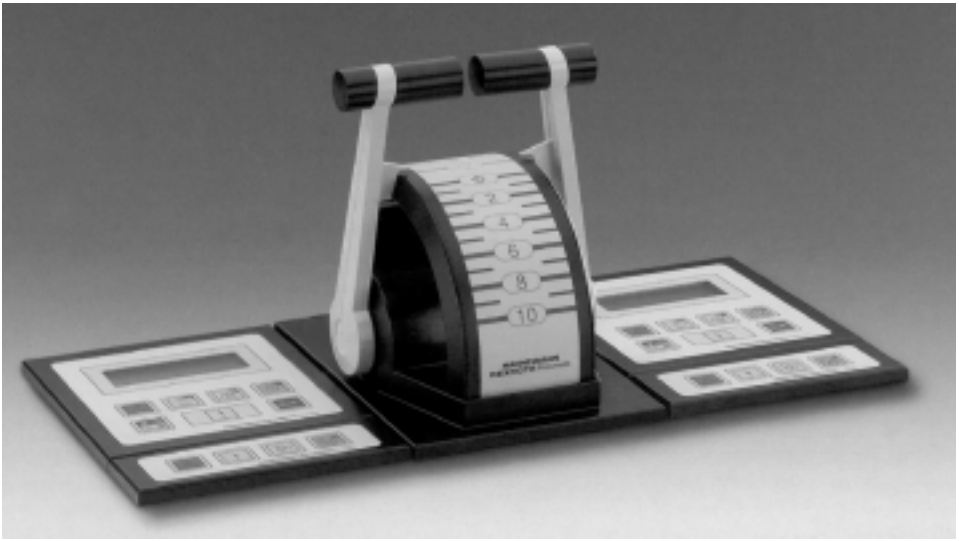

MAREX OS in any case....
the remote control with CAN bus

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

Rexroth Marine Technology

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