THE AUSTRALIAN NAVAL ARCHITECT

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Cover Photo:

The ANZAC class frigate *Warramunga* entering the water at her launching on 23 May 1998 (Photo courtesy Tenix Defence Systems).

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A NOTE FROM THE DIVISION PRESIDENT

I am pleased to be able to contribute to Volume 2 No. 2 of the journal. I hope that there will be many more issues.

We were fortunate to have the President, Dr John Parker, and the Chief Executive of RINA, Mr. Trevor Blakeley, visit us from London since we last went to press.

Dr Parker was here on a private visit at the end of March and he gave a very interesting paper on *The Design and Evolution of Innovative Marine Vessels* which was presented to a meeting of the Sydney Maritime Panel of the Institution of Engineers, Australia (IEAust).

Mr. Blakeley was in Australia towards the end of May

and during his stay he met with the West Australian, Sydney and Canberra sections of the Division. While in Canberra he met with officers of the IEAust and, I understand, there were informal discussions on closer links in Australia between the two institutions. I also understand that these discussions will be continued in early July when the President and Chief Executive of IEAust visit London. No doubt the Australian Division will be consulted before any firm decisions are made on future association between IEAust and RINA in Australia.

I had my little wrist slapped by the Chief Executive when he was in Australia. The reason for this was the Division Council had the temerity to have discussions with the Australian Division of the Institute of Marine Engineers concerning a memorandum of understanding that dealt with forming closer ties between the two Australian bodies. I find this admonishment difficult to understand given that there is already a close working relationship in the locations where there are sections/branches of both bodies out here. Also there is a joint branch in Hong Kong as well as joint branches UK.

By the time this edition goes to print I will have been to London for the Council meeting that is to formally approve, or otherwise, our new administrative arrangement for the Division. I am hopeful that we will be able to institute the new arrangement in the fourth quarter of this year. On this basis some thought should be given by the members of each of the sections to the choice of representative for the new Division Council.

I hear around and about that there are moves to privatise the safety functions of some of the state maritime authorities. It is my opinion that, as a responsible professional body, we should resist these moves, as we did in NSW because the public interest is best served with the administration of safety residing within Government rather than this important function being left to private sector.

As you will be aware, although the time is freely given in preparing the journal, expenses are involved in printing and distribution. Therefore if any one can arrange for advertising to be provided all contributions will be gratefully accepted. John Jeremy is the point of contact.

I look forward to providing a few notes in the next edition when I will be able to give a commentary on the proceedings of the Council meeting to be held in London on 21 July.

Noel Riley
Division President

FROM THE CHIEF EXECUTIVE

I would like to thank all those members of the Australian Division Council, and Western Australia, NSW and Canberra Sections for their warm welcome and hospitality during my recent visit to the Division.

I was also grateful to Lawry Doctors for enabling me to meet and speak with students at UNSW.

Whilst I am in no doubt about the value which the Institution places on its Australian membership, and indeed all its overseas members, I do understand the concerns felt by some members that this might not be the case. I also appreciate the feelings of some members that they do not receive value for their subscriptions. As you might expect, I would not entirely agree with that view, and would ask Fellows and Members to remember what they paid as Junior and Graduate Members. Nevertheless, if such a perception exists, then it must be addressed. I now know that some members are not aware of some of the benefits which exist, such as the technical information service, so clearly we must keep members better informed. During my visit to the Division, I did receive a number of suggestions for improving Institution services, such as expanding the technical database, increasing the involvement of overseas members in the management of the Institution, through membership of its committees, raising the profile of RINA in Australia to help recruitment, all of which I will address. I will always listen, reply and take action where I can.

I came away from my visit to the Division with a much better understanding of the unique position of the Division and the needs of RINA members in Australia. It has given me the opportunity to hear at first hand how relationships between Headquarters and the Division can be improved, mainly through better communications, both ways. And even if I have not fully understood or agreed with some of the comments made, I have been able to appreciate the strength of feelings and concerns felt by some members, and that has been equally important.

I look forward to my next visit to the Division, which I hope will include the Melbourne and Tasmania Sections.

Trevor Blakeley
Chief Executive

EDITORIAL

In March this year the second Report of the Australian National Audit Office into the Collins class submarine project was tabled in Parliament. The reports in the popular press on the ANAO findings must have given the uninformed reader the impression that the submarines are late, too expensive, don't work and are another example of the mismanagement of major defence projects in this country.

These impressions result from selective reporting of some of the more critical aspects of the ANAO Report and do not do justice to the project, or even the Report.

The ANAO was critical of several aspects of the project. Some of these criticisms are perhaps justified whilst others many would regard as reflecting unrealistic expectations, which if required for future projects could result in even less work of this nature being undertaken in Australia. For example, there is a limit on the amount of risk that industry will take on developmental projects before deciding that the potential returns do not justify such exposure.

In undertaking this review, the ANAO recognised the technical complexity of the project and engaged suitably qualified consultants to help. Their contribution to the review is reflected in the key findings of the report, where the ANAO says *"The Project has some significant project management, engineering and construction achievements which in many ways demonstrate the capacity of Australian Industry to produce to world-class standards. But there are some management and technical problems that remain unresolved. Some problems result from immature design aspects associated with development of a large and complex 'first of class' submarine. This needs to be acknowledged and understood."* Even this modest recognition of the considerable challenges and achievements of this project received little exposure in the public arena.

We have a tendency in Australia to critically analyse our major public expenditures in a way that tends to obscure achievements. This is not new – I remember a phrase invented, I think, in the 1970s – 'paralysis by analysis'. Nor is it necessarily a bad thing – it helps us learn from our experience. But public opinion, as distinct from expert opinion, has a considerable influence on the politicians who decide our future defence purchasing policy. That public opinion is shaped by the press. As professionals it is important that we do what we can to provide the proper expert input to the decision-making processes to help governments get it right.

By all means let us analyse the problems of major projects like the Collins class, recognising the achievements and identifying the problems. The challenge is to learn from this experience and move forward.

John Jeremy

[The text of the ANAO Audit Report No 34 is available at `www.anao.gov.au`]

LETTERS TO THE EDITOR

And to the President, as follows:

Dear President,

I refer to Vice-President P.J. Helmore's article *Do You Mean Draft When You Say Draught?* in the April 1998 issue of *The Australian Naval Architect* journal where results of a private survey into alternative spellings in the English language were given.

Mr Helmore indicates that his population of 30 respondents provides some justification for influencing the spelling of the word *draught*. I would like the RINA to confirm that Mr Helmore's survey is in no way associated with the RINA and is not the RINA's position. Furthermore, ask him to confirm that he has in no way compromised his position as a vice-president of the RINA in communicating his private thoughts to the Professor Peters he mentions in his article.

Peter C. Pengilley
MRINA, CEng.

The President replies...

I confirm that Mr Helmore's survey was conducted independently of the RINA. The RINA would not presume to adopt a position on such a matter.

Noel Riley
President

Mr Helmore replies...

My intention was not to influence anyone's spelling of the word *draft/draught*, as both spellings are correct. My interest was in which spelling was more commonly used. Having done the survey, it occurred to me that others may be interested in the results; hence my article and contact with Professor Peters. Other comments I have received have borne this out.

The results given to Professor Peters were not private thoughts, but the results of an independently-conducted survey of professionals in the industry. I confirm that I have not compromised my position on the RINA Council.

I have pointed out that my survey had limitations. However, a small survey is better than none. Professor Peters is well aware of the lexicographer's problem of how to weight the usage of professional against that of the community at large. My results give her helpful data on what professionals in this industry use; none on what the community at large uses, and so the article is being reprinted in the June/July issue of *Australian Style* to allow for wider discussion. I am sure that she would be delighted to receive the results of an extensive survey!

Phil Helmore

Dear Sir,

I Mean Draught When You Hear Draft

Your survey of naval architects was interesting, but disturbing in its findings. There are two perfectly good words, "draught" and "draft" which, according to most dictionaries, have two quite separate meanings: the depth of water to float a ship is clearly spelt "DRAUGHT".

I accept that language is changing and influenced by its users, but this is no excuse for ignorance and laziness. If several Australian-educated naval architects feel that the spelling "draught" is archaic, then I suggest that their customers look carefully at their work. Do these same people cut corners on their work?; are they lazy in their approach?; are they ignorant?

And where does it stop? Already you hear the word "dra" in use (as in "wazza dra", when there is an enquiry about the draught). Does this mean that soon the spelling will be changed to "dra" as well?

Our language is full of beautiful and descriptive words, many of which are dying out at a rate probably exceeding that of our endangered animal species. We have a modern-day consciousness about nurturing these animals, and the same needs to be thought about for our language, otherwise life will become BLAND, BLAND, BLAND, and all because of our naval architects! We must use the words that we have, and enjoy them, otherwise life will become a floccinaucinihilipilification (Chambers Twentieth Century Dictionary refers).

I have no doubt that this topic will prove to be the most contentious and the most-discussed one since the arguments about short-and-fat or long-and-thin, so I congratulate the author on raising it. However I note with concern that your correspondent has shortened his name to "Phil" from the name that he was given at birth, so presumably he doesn't mind shortening anything important.

Ooops, what is this word "doesn't"? I mean "does not".

Neville A. Armstrong

Mr Helmore replies...

I enjoyed your viewpoint. However, we must be looking at different selections of dictionaries; in the ones I looked at, there are many meanings for both spellings and both spellings are accepted for the depth of water needed to float a ship. You may choose to rely on a foreign dictionary within two-and-a-half years of its use-by date, but you are swimming against the Australian tide.

Shortening of a birth name is a red herring as far as correct usage of Australian English is concerned, but seems to me to be a lesser transgression than using a contraction of your *secondary* birth name. Similar to using a secondary spelling for draft, eh Tony?

Phil Helmore

ACKNOWLEDGEMENTS

The response to the first four editions of The Australian Naval Architect (so ably produced by David Lugg and his colleagues in Western Australia) has clearly demonstrated the need for a journal such as this for the members of the Australian Division of the RINA. This edition is the first to be produced in New South Wales, and it will hopefully be the first of many.

The ANA exists for the benefit of RINA members, to provide information about the activity of the RINA in Australia, interesting information and technical papers on maritime matters, and to help foster a sense of community amongst the members. It cannot survive without the support of those members who provide material and submit papers for publication. Material that is published is credited to the contributor and their support is gratefully acknowledged. The support of companies who have willingly supplied photographs and other material is also gratefully acknowledged.

The ANA is keen to publish papers prepared by members or presented at Section meetings. However, papers that are submitted will have to survive the scrutiny of the Editorial Committee (John Jeremy and Phil Helmore).

NEWS FROM THE SECTIONS

Canberra

The year started for the Canberra Section of RINA with its annual general meeting on 23 February. At the meeting, means of sustaining the activities of this small section were discussed amongst other matters.

Following the AGM, Ian Laverock has taken over the reins as Chairman from John Colquhoun while Martin Grimm has taken on the task of Secretary previously performed by Dudley Simpson. Dave Magill and Nick Whyatt continue to serve as Deputy Chairman and Treasurer respectively. Other committee members are John Colquhoun who is also the section representative on the Australian Council, RADM Bill Rourke (Ret) who also provides a link with MARENSA, Bert Thomson and Tom le Grice.

The first technical meeting of the year with a naval architecture theme on 25 March was in fact organised by the Institution of Engineers, Australia as Martin Williams of ADI presented a paper dealing with design and construction aspects of the Huon Class minehunters currently under construction at ADI in Newcastle. The interest in this paper could be judged by the attendance level and number of questions Martin fielded following his presentation.

The section welcomed the RINA Secretary, Trevor Blakeley, to Canberra on the evening of 28 May at an informal dinner at the Ainslie Football Club. The Secretary noted some of the new initiatives and changes that were being implemented by RINA HQ and shared his views on how RINA could best serve its members outside the UK. Section members provided Mr Blakeley their insights of the naval architecture community and activities in Australia, highlighting the importance of the Division to sustaining local activities, particularly noting the small and fragile nature of some sections of the Australian Division. Bill Rourke had arranged for Mr Blakeley to meet with John Webster, Chief Executive of IEAust and Ian Laverock at the National Press Club earlier in the day, which provided a good opportunity to discuss the possibility of closer links between IEAust and RINA. On 17-18 June a symposium was organised by Ian Laverock for Defence naval architects at HMAS *Creswell*. Papers presented over the two days following an opening address by DGNMR, CDRE Peter Hatcher, included 'The Informed Customer in the RAN' by Gordon MacDonald; 'NBC Defence Capability in the RAN' by Darren Toohey; An Overview of MISD by Messrs Cox, Wilhelm and Swain; 'NMR Computer Aided Modeling Capability' by Messrs King, Simper, Gerwien and Paine; 'Design & Production of Anzac Class Frigates for the RAN & RNZN: Progress Towards International Competitiveness' by John Lord; 'Magazine Design' by LCDR Rob Woodcock; 'RAN Ship Structural Integrity Capability' by Bernie Phelps of DSTO, 'Hull Survey and Repair Standards for GRP Monocoque Hulls' by John Colquhoun; 'FE Modeling of a Submarine Hydraulic Coupling' by Daniel Curtis and 'A Career Guide for Defence Naval Architects' by Mark Gairey.

While the committee has had no shortage of ideas for presentations at future technical meetings of the section, presenters are now the only missing ingredients!

Roger Duffield, graduate naval architect from AMC employed by the DoD will present some of the results of his thesis work on the squat behaviour of ships travelling in shallow water over an undulating seabed on 8 July. In August, Martin Grimm will give a run-down on seakeeping analysis and thoughts on refining the methodologies currently in use. Any visitors from interstate who are willing to present a topical maritime related paper to the section would be most welcome and should contact the section secretary to make the necessary arrangements.

Martin Grimm

Sydney

The RINA has recently held three combined meetings with the Institute of Marine Engineers in Sydney:

On 22 April Martijn van Wijngaarden, a marine consultant, gave a presentation on *Marine Pipeline Installation and Floating Equipment Development*. Offshore oil and gas pipelines are welded together on board a specialist pipe-laying vessel, and lowered to the sea-bed under tension in an S-curve, partly supported by a stinger at the vessel's stem. Dynamic positioning is used to control the vessel's position via a segregated diesel-electric power plant and computer control of the thrusters. Pipelines have recently been installed in water depths over 1000 metres. The world's largest pipe-laying vessel, a conversion from a bulk-carrier, has recently been commissioned in the UK.

On 27 May Frank Leclerq, AMSA's Survey Manager NSW, gave a presentation on *Port State Control.* He described the development of port state control in Australia by AMSA. Australia is internationally recognised as one of the leaders in the performance of

port state control. The *Ships of Shame* inquiry highlighted some of the problems which existed, and he described what AMSA has done since that inquiry in the areas of Asia-Pacific regional co-operation, IMO developments, bulk carrier safety, and crew competence. AMSA's 1997 Port State Control Report is available from (02) 6279 5050 or e-mail melissa.tarlinton@amsa.gov.au. Information about vessels detained by AMSA is available directly on AMSA's web-site at `www.amsa.gov.au/sp/shipdet/sdetlink.htm`.

On 24 June Lawry Doctors gave a presentation on *Current Research in Ship Hydrodynamics*. He focussed on three principal aspects: the accurate prediction of resistance, the prediction and minimisation of ship motions, and the prediction and minimisation of the wave wake for river ferries. The presentation was well illustrated by slides showing the various types of craft, the approximations which have to be made to make the problems tractable, and the results. And there was only *one* double integral!

Phil Helmore

Victoria

On 16 June Mr. Bob Herd addressed a joint IMarE/RINA meeting in Melbourne on "Forensic Naval Architecture". Mr Herd's address was based on his experiences and observations of five Australian maritime disasters over the period from 1966 to 1974. Over 30 lives were lost in the incidents.

The disasters discussed by Mr. Herd included the bucket dredge *W D Atlas* which capsized and sank in 1966 in heavy weather off the NSW South Coast during a voyage from Whyalla to Sydney, en route to New Zealand; the oil rig supply vessel *Sedco Helen* that sank in Bonaparte Gulf in 1970 while attempting to retrieve a submerged mooring buoy, and the small (1481 GRT) roll-on roll-off vessel *Straitsman* that partially capsized and bottomed in the River Yarra due to water entry through the stern door.

Mr. Herd also discussed the loss of the freighters *Noongah* (in 1969) and *Blyth Star* (in 1973).

These incidents resulted in a number of changes to maritime safety legislation in Australia. These included requirements for watertight doors to be operable from both sides of the watertight bulkhead, and from the deck above, and for stern, side-shell and bow doors to have visible and audible warnings on the bridge to warn bridge personnel that they are open. Further lessons suggested from these incidents by Mr. Herd were that details should not be overlooked in maintaining the safety of vessels, and that strange occurrences, such as an inexplicable self-correcting list, should be investigated and explained satisfactorily.

On 19 May Mr. John Robertson and Mr. Rob Dunbar, of Australian Marine Technologies (AMT), addressed a joint IMarE/RINA meeting in Melbourne on the ANZAC Warfighting Improvement Program (WIP). AMT (then Blohm + Voss Australia Pty Limited) was the original designer of the ANZAC class frigate which is a development of the MEKO 200 design.

The ANZAC WIP was instituted by the RAN to address changes in weapons technology and its application at sea since the original ANZAC specification was drafted in the early 1980s. It includes improved detection, evaluation and assignment capabilities and improved weapons.

At present the WIP is mainly a concept and definition study. While it is aimed primarily at Combat Systems improvement it includes supporting improvements in platform systems, integrated logistics support and shore facilities. AMT's contribution to the WIP studies, together with CelsiusTech Australia and CSC Australia, has been primarily in the Platform Systems area. Support with studies of Combat Systems facilities and Integrated Logistics Support was provided by Scientific Management Associates.

All the combat system alternatives under consideration involve significant changes to antennae and equipment arrangements, and therefore to the ship's appearance. They also have a significant effect, to varying degrees, on displacement. The ship's centre of gravity is also affected by the required relocation of existing equipment and facilities. AMT has incorporated on-board configuration changes within its study to provide compensation for these adverse effects.

In most cases an increase in electrical generating capacity is also required, and one alternative includes an additional generating set. These increases in generating capacity are exacerbated by parallel increases in chilled water capacity to dissipate the increased heat from the combat systems equipment. Feasible solutions to these issues are proposed by AMT in its study.

The ANZAC WIP, when implemented together with other changes already planned or approved, will represent a significant increase in the capabilities of the RAN's ANZAC frigates. AMT would appear to be well placed to develop its design solutions in further stages of this programme.

Bryan Chapman

[An article on the ANZAC WIP is planned for a future edition of the ANA – Ed.]

Western Australia

The May section meeting visit proved to be one of our most popular with over 30 people probing the submarine HMAS *Collins* from torpedo tube to stern gland. About half that number attended the following month to hear maritime archaeologist Tom Vosmer, a research associate at the Western Australian Maritime Museum, talk about his fieldwork study "Seacraft of the Arabian Gulf". Tom spoke enthusiastically about hand-sewn boats and his journey along the Arabian coastline as he displayed magnificent slides of his trips to the Sultanate of Oman.

Andrew Mason of Formation Design Systems is the July guest speaker. His presentation will not be about the company's successful hull design software but another passion, the restoration of his yacht, one of the oldest in Australia.

David Lugg

Also from the West

The inaugural Sikaflex WA Shipbuilders Swan River Quadrathalon was held on Sunday June 28. Eight teams competed in the run, cycle, swim and sailing event followed by a sausage sizzle and refreshments under the sponsors' marquee. The success of the event ensures it will be repeated next year.

Oceanfast snatched victory from the jaws of defeat as the dominant team Austal Foundation 36 yacht floundered on a sandbank within sight of the finish line.

Thanks go to Geoff Leggat for organising the event and the sponsors, Sikaflex, Beurteaux, Ayres and Camerons for their support.

David Lugg

COMING EVENTS

21st Century Marine Engineers

A one-day seminar *Fifty Years on and Meeting the Twenty-first Century* will be held by The Institute of Marine Engineers to mark the half-century of the operation of their first overseas branch, in Australia. The seminar will be held on 18 November 1998 at UNSW. The programme includes papers by the following authors: Keith Murray (IMarE), John Jeremy (RINA), Alan Taylor (BHP Transport), Martin Renilson (AMECRC), Michael Johnson (ABS), Phil Hercus (Incat Designs), Aji Pal and Stan Earl (AMC), Craig Hughes (DNV), Ian Williams (AMSA) and Bob Wackett (MAN).

The seminar will culminate with the combined IMarE and RINA annual dinner at the Roundhouse in the evening. Please mark this date in your diary now. Further information may be obtained from Laurie Prandolini (02) 9878 1914 (e-mail `sbimare@msn.com`)

Melbourne

Joint IMarE/RINA meetings are held in Melbourne on the third Tuesday of every month except December and January, generally at the IEAust Building at 21 Bedford St, North Melbourne. For more information contact Howard Mumford (03) 9623 1263 or Bryan Chapman (03) 9857 9011.
On 21 July 1998 Mr. Mike Curran of Lloyds' Register will speak on implementation of the Integrated Ships Management (ISM) Code. This Code became mandatory on 1 July 1998. A further meeting is planned for 18 August 1998.

Sydney

On 23 September 1998 there will be a joint meeting of the RINA Sydney Section and the Sydney Branch of the Institute of Marine Engineers at the MSB Centre, 207 Kent Street Sydney, starting at 6 p.m. A speaker from Lloyd's Register will speak on IAC requirements for evaluation of Bulk Carrier bulkheads and double bottom structures. For further information contact Alan Mitchell on (02) 9819 7775.

Sea Australia 2000

This major conference will be held in Sydney between 20 and 22 March 2000. Organised by the RINA, ImarE, IEAust and AMECRC, the Sea Australia Congress 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. Interest in submitting papers or in receiving further information can be registered by contacting the Sea Australia 2000 Congress, c/o ICMS Ltd., telephone (02) 9976 3245, fax (02) 9976 3774 or email `seaaust@icms.com.au`.

THUNDER FROM DOWNUNDER

In June this year a dock ship was crossing the Indian Ocean delivering to the Mediterranean one of the most advanced motor yachts yet built. Launched by Oceanfast Marine Pty Limited in Western Australia on 22 February, *THUNDER A* was designed by Phil Curran and Jon Bannenberg and built to the full requirements of the new MSA Code of Practice for Safety of Large Commercial Sailing and Motor Vessels.

THUNDER A is of all composite FRP construction (designed by SP Technologies) and took two years to build. Accommodation is provided for ten passengers (owner and guests) and eight crew. The 49.8 metre yacht is powered by two MTU 16V396TE94 diesels of 2,000 kW each, with one Allied Signal TF40 gas turbine for high-speed boost. The engines drive three KaMeWa water jets.

The designed speed of *THUNDER A* is 40 knots at light load, 35 knots at full load and 22-25 knots on diesel power alone. She achieved 41.2 knots on trials.

Oceanfast are developing an 80 metre, 40 knot monohull as an extension of their high-speed ferry technology to pave the way for even larger and faster private yachts.

Oceanfast have also recently received an order from Howard Smith Towage for a tug for service in Melbourne. The $8.3 million tug will be built at Oceanfast's Commercial Division.

The new 33 metre tug will be a stern-driven omnidirectional vessel with a bollard pull of 60 tonnes.

This order brings the total number of tugs on order from Oceanfast to seven, worth over $50 million.

An interesting conversion by Oceanfast was completed on May 16 with the departure of the ex-Netherlands government pilot vessel *Altair*. The conversion to a luxury motor yacht included the replacement of the superstructure and the construction of accommodation for the owner and his guests and a crew of 20.

THUNDER A on sea trials (Photo courtesy Oceanfast)

ANZAC SHIP PROGRESS

Tenix Defence Systems achieved further milestones in the ANZAC ship project during May with the sea trials of third ship of the class, *Arunta*, and the launching of the fifth ship, *Warramunga*.

Warramunga was named and launched by Mrs Joy Willis, widow of Rear Admiral Alan Willis OBE RAN, the last commanding officer of the Tribal class destroyer HMAS *Warramunga*. Built by Cockatoo Dockyard in 1942, *Warramunga* served with distinction during the Second World War and the Korean War and was paid off in 1959. The new ship also honours the Warumungu aboriginal people from the Tennant Creek area of the Northern Territory.

Tenix Defence Systems is now well advanced with the programme to build ten ships of this class, two for the Royal New Zealand Navy and eight for the Royal Australian Navy. HMAS *Anzac* is already in service with the RAN, and HMNZS *Te Kaha* is in service with the Royal New Zealand Navy. After completion of fitting out following sea trials, *Arunta* will be delivered to the RAN later this year. The fourth ship (for New Zealand) *Te Mana* will start sea trials at the end of 1998. Trials for *Warramunga* will be carried out at the end of 1999 with delivery to the RAN in 2000.

Modules for the remaining ships *Stuart*, *Parramatta*, *Ballarat*, *Toowoomba*, and *Perth* are also being built by Forgacs Shipbuilding in Newcastle (hull modules for *Stuart*) and by Tenix Shipbuilding at Whangarei in New Zealand.

Above: Arunta during Contractor's Sea Trials.
Below: Warramunga after launching
(Photos courtesy Tenix Defence Systems)

LAUNCHING OF MINEHUNTER HAWKESBURY

The second of the six Huon class minehunters being built by ADI Limited in Newcastle was named *Hawkesbury* and launched on 24 April 1998. The ship was named by Mrs Jenniffer Smyth, wife of Commodore Dacre Smyth, the last commanding officer of the previous HMAS *Hawkesbury*, a River class frigate built by Mort's Dock and Engineering Co. in 1943.

Work is now in hand on five of the six ships in the class. Sea trials for the first ship in the class, *Huon*, began on 25 June. The trials of *Hawkesbury* are scheduled for the first half of 1999. Early outfitting of the third ship, *Norman* is underway while outfitting of major compartments such as the engine room of the fourth minehunter, *Gascoyne*, is well advanced. The keel of the fifth ship, *Diamantina*, will be laid in August and work on components has already begun. Over 550 people including 100 contractors are now employed at ADI's Newcastle facility.

The Huon class is an improved version of the Italian Lerici class, of which 36 variants are in service or on order in five navies. The design has been extensively modified in Australia by ADI for the RAN with 3D computer modeling being used to validate layout, access and shock clearances.

The minehunters have a length of 52.5 metres, a beam of 9.9 metres and a draught of 3 metres. The full load displacement will be 720 tons. The ships are constructed in FRP with a single skin monocoque structure without longitudinal or transverse stiffening other than the transverse bulkheads, which are intentionally thin and are tapered to flex under shock loadings. All machinery is mounted on cradles suspended from bulkheads or deckheads, and fuel and water tanks are mounted between the watertight bulkheads, clear of the hull.

Hawkesbury ready for launching
(Photo courtesy ADI Limited)

Accommodation is provided for 49 crew. The main propulsion is a single 1,460 kW Fincantieri diesel driving a controllable pitch propeller. The auxiliary propulsion system comprises three 124 kW Riva Calzoni retractable auxiliary propulsion units (one forward and two aft). The maximum speed on the main engine is 14 knots, and 6 knots on the APU's. The range is 2,400 miles at 10 knots with 5% fuel remaining.

MORE LAND FOR SHIPBUILDING IN WA

For several decades in Australia it has been common for shipyards to be turned into development sites and parkland as the continued use of waterfront land around the country for industrial purposes has come under pressure from the community.

In a welcome move the Minister for Planning in the Western Australian Government, Graham Kierath, announced in April a proposed planning amendment which will allow for more land to be released at the Henderson Industrial Estate in Jervoise Bay.

Another 2.8 ha of land next to Austal Ships would be set aside for shipbuilding facilities. The amendment proposes to change the status of Lot 167 Cockburn Road from a parks and recreation zone to an industrial zone. The proposal was to be open for public comment until 11 July.

NEW CUSTOMS PATROL BOATS ORDERED FROM AUSTAL SHIPS

On 11 May the Minister for Customs and Consumer Affairs, Mr. Warren Truss, announced that Austal Ships Pty Limited in Western Australia had been awarded a $58.4 million contract to build a new fleet of Patrol Boats for the Australian Customs service.

The eight aluminium patrol boats will be capable of operating around the coastline and throughout the 200 nautical mile Economic Exclusion Zone. The first of the boats, to be known as the Bay class, is due for delivery in March 1999. The remaining seven vessels will be delivered progressively with the last planned in February 2001.

Austal will also provide a comprehensive maintenance programme for the boats for a period of 3 ½ years in conjunction with Stirling Marine and Adsteam Marine. The Commonwealth has the option to extend the maintenance service to a ten-year period. In addition to maintenance, Austal will provide training to Customs personnel including the handling of the patrol boats and their tenders, and engine training courses.

Austal Ships has exported over 55 high-speed vessels, but this contract is the company's first for the Commonwealth. In May, Austal had orders in hand for 14 vessels worth over $230 million. The Managing Director, John Rothwell said that the company would be seeking to recruit 200 more tradespeople over the next twelve months, increasing their workforce to around 1,000.

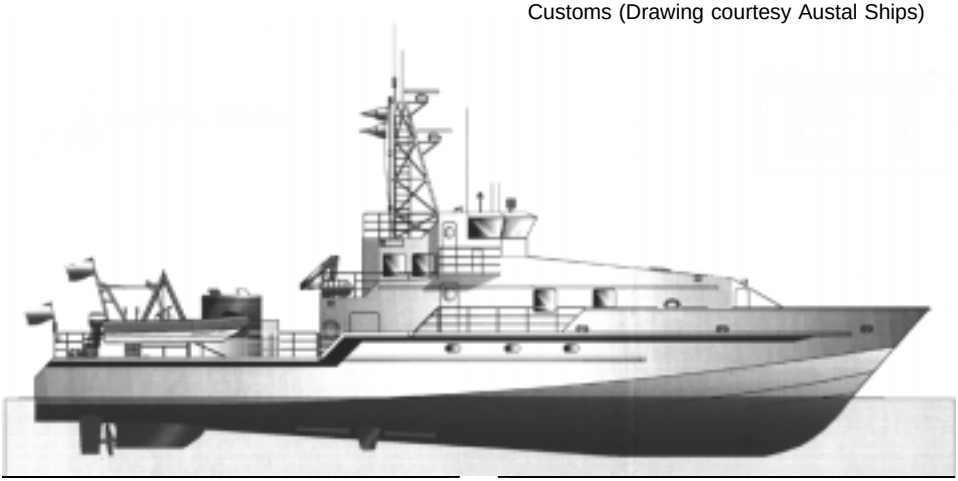
The Bay class patrol boats will have a length of 35 metres, a beam of 7.2 metres and a displacement of 112 tonnes. They will be powered by two MTU 16V2000 M70 diesels for a maximum speed of 20 knots. Accommodation will be provided for twelve in two-berth cabins, with 4 temporary berths and space for twelve passengers on the aft deck. They will be fitted with an ECDIS style integrated bridge and comprehensive communications. The radio fit will not only enable communications on civilian frequencies but also secure communications with Department of Defence ships and aircraft, Coastwatch aircraft and Customs shore installations.

As tenders the patrol boats will carry two 6 metre rigid hull boats with segmented non-inflatable collars fitted with two 90 horsepower Honda outboards. They will be fitted with satellite communications and have a range of 150 miles at 25 knots.

The patrol boats will be used by Customs to carry out day and night patrols in sea states up to and including sea state 5. They will be employed in Australian waters and the Exclusive Economic Zone up to 200 miles offshore north of latitude 45 degrees south.

The Bay class will be capable of towing other vessels up to 150 tonnes while maintaining the ability to launch and recover tenders.

The new Bay class patrol boats for Australian Customs (Drawing courtesy Austal Ships)



A little history…

Many older Australian naval architects will remember one of the most famous of the Australian Customs patrol boats, *Vigilant*. Designed and built at Cockatoo Dockyard in Sydney, this 102 feet long (30.9 metres) ship was the first vessel to be built in Australia in which aluminium was used as a structural material. The deckhouse was built in alloy 57S supplied by Aluminium Union Limited. *Vigilant* was completed just 60 years ago on 25 July 1938. The ship was based in Townsville until requisitioned by the RAN in 1940 and then served under the names *Vigilant*, *Sleuth*, and *Hawk*. Sold in 1946, she became *Vigilant* again in the service of the Nor'-west Whaling Company of Perth. The little ship operated as a whaler between July and September normally anchoring in the Canning River for the remainder of each year. Sold again in the 1960s, she returned to Sydney and began a conversion to a passenger ship for cruising, but the work was never finished and she was finally broken up in Sydney.

For many years naval architecture students in Sydney used the *Vigilant*'s lines for exercises and probably no other ship has had so many sets of hydrostatics and cross curves prepared.

Vigilant on trials in Sydney harbour in 1938.
(Photo from J Jeremy collection)

NEWS FROM NEW SOUTH WALES

Under Construction

A 21-metre aluminium high-speed monohull charter vessel is being built by Roger Muttima at Newcastle to a design by Tony Armstrong. The vesel is framed up and ready for plating.

The Waterways Authority have recently taken delivery of two 10-metre high-speed garbage collection vessels which were built by O'Brien Aluminium at Smithfield to a Waterways Authority in-house design. Each vessel has a one-tonne crane on the foredeck for recovery of refuse. As a matter of interest, O'Brien Aluminium also supply fabricated components to Incat Tasmania for their vessels.

A 16-metre aluminium catamaran for charter work is nearing completion at Yamba Welding to a design by Owen Cropp. This vessel is interesting because the constuction is frameless, using extruded aluminium planks, and is the largest of its type.

Bashford International are building an 11 metre yacht designed by Murray, Burns and Dovell for charter with Eastsail.

Seawind Catamarans are building 12.2 metre and 10.7 metre catamarans for NSW survey.

Sydney Heritage Fleet

The Sydney Heritage Fleet (formerly Sydney Maritime Museum) is proceeding apace with the restoration of *James Craig*. The vessel is back in the water and the masts are all up, with the exception of the mizzen topmast which is expected up by publication. Work is progressing on the standing rigging, the course yards and lower topsail yards are up on the foremast and mainmast, and it is expected that the other yards will be raised progressively over the next six months as the ballast is installed. The new engine beds are being installed, and the vessel will be docked for installation of the sterntubes and brackets in 1999. It is expected that the vessel will be sailing in 2000.

Restoration is about to commence on the elderly Sydney ferry *Kanangra* with a docking in July at Starkstroms (who have taken over the 500-tonne Goat Island Slipway) for ultrasonic testing of hull plates. *Kanangra* was built by Mort's Dock and Engineering

Co. and was launched on 14 August 1912 for Sydney Ferries Ltd. She is 45.4 m (149 ft) between perpendiculars and was originally licensed to carry 1075 passengers. She had her triple-expansion steam engine replaced by a diesel in 1959, and lost one knot but saved forty percent of her running costs. She saw seventy-five years of service on Sydney harbour, the longest service of all the Sydney ferries. An undergraduate thesis project being undertaken by David Gosling at the University of NSW has concentrated on determining what modifications will be necessary for *Kanangra* to meet current stability and subdivision requirements to carry 250 passengers, in addition to producing a preliminary stability book and compiling details of her history.

John Oxley is now high and dry on the slave dock, and a major survey of hull plates and frames will commence shortly.

Phil Helmore

NEWS FROM NORTH QUEENSLAND

Activity in the shipbuilding, boatbuilding and repair industries has been continuing at a hectic pace over recent months. However, there is a cloud over prospects in the immediate future as a number of significant projects have recently been completed, or are approaching completion.

NQEA is the major player in the north with their activities focussed on construction of the RAN hydrographic ships HMAS *Leeuwin* & HMAS *Melville*. These sophisticated vessels are being constructed under a contract worth $162 million, generating employment for about 300 persons over three years. *Melville* was recently launched on 23 June to join *Leeuwin*, which is currently undergoing extensive sea trials.

The hydrographic ships are 72 metres in length and displace 2,550 tonnes. They will have a range of 8000 nautical miles with an operational survey speed of 12 knots, and have a complement of 47. They will be operational for 300 days per year and will gather and process hydrographic data covering 10,000 square miles of surveyed area off Australia's northern coastline each year.

The ships are fitted with state-of-the-art mechanical and electronic systems and will be worthy of a dedicated article in future issues.

NQEA have also recently launched two 30 metre low wash ferries, designed and constructed in house, and designated as the River Runner 150 class. The vessels are destined for French Polynesia where they will transport up to 115 passengers on an inter-island service at a service speed of 22 knots. They are powered by twin Caterpillar 3196 diesels rated at 315 kW.

Cairns Custom Craft are prolific builders of small aluminium craft, and have this month launched a 16 metre, 25-knot aluminium catamaran workboat for export to Indonesia. They also have under construction a 17 metre alloy game fishing vessel of novel gull-wing hull form for export to Japan.

Subsee Australia have recently completed a custom designed 24 metre aluminium monohull dive boat with accommodation for 34 berthed passengers, which has set a new standard for dive boats in the Barrier Reef area. They are currently approaching completion of a new-generation 20-metre reef viewer with expansive acrylic windows for underwater viewing. Recent deliveries include a 20-metre reef viewer, which was constructed under Spanish survey and exported to Spain.

A number of game boats up to 15 metres in length are also under construction around Cairns.

A 35-metre steel landing barge was recently completed by a local operator for use in the Torres Strait area. Many operators have been busy with extensive modifications to their existing vessels, including jumboisations, crane installations, ramps, accommodation blocks etc. The most significant modification is a 4,000 tonne sand carrier currently under major conversion to a 105 TEU container carrier.

Cairns has also been adopted as a base by an Australian/Singaporean joint venture developing the first commercial WIG craft. Construction of the first 8 seat craft is currently underway in Germany with delivery scheduled for early 1999. It is intended that future vessels will be built in Cairns.

Geoff Glanville

RECORD FOR INCAT SHIP

At the beginning of June the fast passenger ferry *Catalonia*, built by Incat in Tasmania, found a place in the record books. En route to Barcelona the 91 metre *Catalonia* won the Hales Trophy for the fastest average speed on a crossing of the Atlantic by a passenger vessel and became the first ship to sail more than 1,000 nautical miles in one day.

During the non-stop journey from New York to Tarifa, Spain, *Catalonia* (with 24 on board) covered an unofficial 2,972 miles at an average speed of 38.887 knots. *Hoverspeed Great Britain* established the previous transatlantic record of 36.65 knots in 1990. *Catalonia* also became the first commercial vessel to sail more than 1000 miles in a 24-hour period, covering 1015 miles at an average of 42.3 knots. The previous record of 924 miles was set by *Hoverspeed Great Britain* and prior to that, by SS *United States* which steamed 868 nautical miles in July 1952.

Catalonia will enter commercial service between Barcelona and Palma de Mallorca in mid June 1998. The 150 nautical mile journey is expected to take 3.5 hours.

The 91 metre wave piercing catamaran is the latest in a series of Incat high speed ferries and was built to the requirements of Det Norske Veritas High Speed Light Craft Rules (classed +1A1 HSLC R1 Car Ferry "A" EO) and the IMO High Speed Craft Code. The ship is designed to carry 877 passengers, 23 crew and 225 cars (or a combination of cars and up to four coaches). The passenger accommodation is of high standard with first class passengers accommodated on the lower deck and the tourist class on the upper deck.

Catalonia is built of 5383 – H116 marine grade aluminium alloy plate with 6082 T6 and 5383 alloys used for extruded aluminium sections. The aluminium superstructure is supported on vibration damping mounts.

The ship is propelled by four Caterpillar 3618 engines built at the Caterpillar Large Engine Centre in Spain. Each engine weighs 36.4 tonnes and develops 7,200 kW. Each engine drives a transom-mounted Lips LJ145D waterjet through a Renk ASL60 reduction gearbox. Four caterpillar alternators of 230 kW (two in each hull) provide AC supply at 415/240 V three phase through associated independent main switchboards.

To improve passenger comfort a Maritime Dynamics Inc. ride control system which consists of an active trim tab mounted on each transom to provide trim and motion damping. On arrival in Barcelona forward active ride control T foils were fitted.

Catalonia is fitted with marine evacuation systems by Liferaft Systems Australia and a light-weight fire protection system by Colbeck & Gunton. Electrotech Australia supplied the comprehensive navigation and communication outfit fitted in the ship.

Catalonia

Principal dimensions and capacities

Length overall	91.30 m
Length waterline	81.34 m
Beam overall (ex fenders)	26.00 m
Hull beam	4.33 m
Hull C/L to ship C/L	10.83 m
Draught (USK)	3.89 m
Deadweight (service)	447 t
Deadweight (maximum)	547 t
Fuel capacity (approx.)	56 t
Long range fuel capacity (approx.)	420 t
Fresh water capacity	5 t
Sullage capacity	5 t

Significant Dates

Keel Laid	12 May 1997
Launched	25 April 1998
Completed	16 May 1998

Trials Results and Performance

Maximum speed (Light)	47.86 knots
Service speed (at 426 t dwt)	43.03 knots
Fuel consumption (100% mcr)	1,733 L/hr.
Fuel consumption (90% mcr)	1,535 L/hr.

Catalonia is only one of five wave piercing catamarans delivered in the first seven months of 1998. The others were the 86 metre *Condor Vitesse* for Condor Ferries in the Channel Islands (delivered in May); the 91 metre *The Cat* (ex *Devil Cat*) for Bay Ferries in the Bay of Fundy (delivered in May); the 91 metre *Cat Link IV*, and *Cat Link V* for Scandlines Cat-Link, Kattegat (delivered in May and July).

Following the success of the *Devil Cat* service on Bass Strait last summer, Incat's first high-speed Ro-Pax, a 95 metre wave piercing catamaran with truck capacity, will be placed on the Bass Strait this summer. The ship will be operated by the TT-Line.

Above: The record breaking wave piercing catamaran Catalonia at speed.
Below: The 91 metre Cat Link V on trials. (Photos courtesy Incat Australia)

THE BLUE RIBAND AND THE HALES TROPHY

It is generally accepted that people have been attempting fast crossings of the Atlantic in ships since 1838, when *Sirius* became the first steam ship to cross. Her glory was short-lived, as *Great Western* arrived one day later in a faster time. However, it was a number of years before this intangible prize came to be known as the Blue Riband. The term was certainly in use by the 1850s.

Then, in 1935, Harold Hales, MP for Hanley in England, offered a trophy for the Blue Riband "to serve as a stimulus to the craft of speed and mechanical perfection". This trophy stands about 1.2 metres high and, around a globe, below a girdle containing four 15th century sailing ships and panels showing four previous steamship holders, a blue riband is supported by two winged figures. The Hales Trophy and the Blue Riband thus coalesced, and formalised the loose arrangements previously in place. The last holder under the original rules was the liner *United States* who won them on her maiden voyage in 1952. The Hales Trophy and the Blue Riband fell into disuse with the advent of jet aircraft.

New trustees for the Hales Trophy were appointed in 1985, and in 1989 they changed the eligibility criteria to include single passages by ships with a demonstrable maritime purpose other than the winning of any trophy or speed record. Purists, however, maintain that the Blue Riband was in existence before the advent of the Hales Trophy, and remains with its original intent in spite of the Hales Trophy and its altered eligibility requirements. The result was that *Hoverspeed Great Britain* won the Hales Trophy in 1990, and *Catalonia* won it in 1998, both vessels having been built by Incat Tasmania. Who holds the Blue Riband, *United States* or *Catalonia*, depends on your point of view, and there is scope for much animated discussion.

Pure speed-boats such as *Virgin Atlantic Challenger I* and *II*, *Gentry Eagle*, and *Destriero*, the current holder of the title "Fastest Atlantic Crossing", are not eligible for either the Hales Trophy or the Blue Riband.

The above information is largely summarised from articles in Lloyd's List Special Supplement, *Transatlantic Challenge 1990*, kindly provided by Tony Armstrong of the AMECRC.

Phil Helmore

WORLD WATER SPEED RECORD

Many are aware that Ken Warby, the current holder of the world water speed record, is building a new boat to break his own record. The record was set in 1978 in his boat *Spirit of Australia* on Blowering Dam, NSW, and stands at 275.8 knots (511.1 km/h). Ken gave a presentation at the Australian National Maritime Museum in February last year about the design of his new boat (ANA March 1997).

Ken is building the new boat in the time he can spare from running a concrete company in Ohio, which is just about to expand by opening a branch in Florida. Despite the demands of business, his new boat is nearing completion; the hull is finished, the jet engine has been installed and the cockpit is now being upholstered. There are controls to fit, and the T-section tail to add, and a month or two to go to completion. The photographs show the boat at mid-June 1998.

There is no schedule yet for the record runs, as Blowering Dam is at a very low level and, even more importantly, there is no major sponsor. So if you know someone at boardroom level who would like some advertising without equal by having their corporate name displayed on the new world-record holder, then ask them to contact Ken. He may be reached via his web-site at `w3.one.net/~warbyinc.`

Phil Helmore

On the way to a water speed record attempt - progress on Ken Warby's new boat in June 1998. (Photos courtesy Ken Warby)

CHANGES IN DEFENCE ORGANISATION

The Department of Defence has undergone a considerable re-organisation in recent months as a result of the Defence Reform Program (DRP). While this will not interest many of you, all the former Defence naval architects who still have warm memories of their time as a Naval Architect Grade 1 in Canberra may be interested in what has become of their beloved Branch and Section. This then is a potted summary of organisational changes over the last ten or so years, complete with acronyms:

Following the recommendations of the Naval Logistics Implementation Team (NLIT) in 1989, the Naval Design Branch headed by DGND was largely reformed as Naval Engineering Services under DGNES. At the same time the division to which the branch belonged, Naval Technical Services, became Naval Materiel Division. This Branch continued largely unchanged until 1996 when it became Naval Materiel Requirements Branch under DGNMR. As a result of the DRP, Naval Material Requirements Branch has transferred from the Naval Materiel Division (which now no longer exists as a single entity) to Support Command Australia.

At the section level, the Directorate of Naval Ship Design (DNSD) became the Directorate of Naval Architecture (DNA) following NLIT. At the same time, the functions of the Directorate of Forward Design - Ship Projects (DFD-SP) were largely absorbed by DNA. In 1996, as a result of an internal reorganisation within the branch, DNA became the Directorate of Engineering Concepts, Capabilities and Naval Architecture (DECCNA). At the same time, the staff of DNA concerned with submarine naval architecture issues became part of the new Directorate of Submarine Engineering Services (DSES) which placed hull, mechanical and electrical engineering expertise for RAN submarines under a single section. A further more substantial reorganisation of the branch in 1997 saw many staff of the former DECCNA forming parts of two new sections while others fell more directly under the management of major projects. The existing new sections concerned with aspects of naval architecture of surface ships then are as follows:

The Directorate of Naval Platform Systems Engineering (DNPSE) headed by Chris Diener is concerned with the range of hull, mechanical and electrical aspects of naval ships and is responsible for the development of naval standards and the provision of specialist support in these areas. The Platform Performance sub-section of DNPSE managed by Bert Thomson covers the naval architecture specialist areas of surface ship stability, structures and Hydrodynamics. The Platform Defence Systems sub-section managed by Ross Wilson includes ship survivability and vulnerability, shock noise and vibration as well as signatures.

The Directorate of Naval Material Concepts and Capabilities (DNMCC) headed by Gordon MacDonald is responsible for the development of conceptual designs and the support of naval projects in their preliminary stages. John Truelove manages the concept design sub-section of DNMCC.

Martin Grimm

RUSSIAN SUBMARINE LEAVES SYDNEY

Heavy lift ships and dock ships are a regular sight in Australian waters delivering the products of the Australian shipbuilding industry, moving oil rigs and shifting other heavy cargo. However, a Russian submarine is an unusual cargo to be loaded out of Sydney.

In 1994 the Foxtrot class submarine 540 was acquired from the Russian Navy by an Australian company, Toledo Enterprises. Decommissioned at the end of 1994, the boat arrived in Sydney on 31 August 1995. Although towed to Australia, about 90% of the submarines systems were still operational, and the submarine made an unusually complete and interesting display alongside the destroyer Vampire at the Australian National Maritime Museum at Darling Harbour.

The Foxtrot class submarines were built at the Sudomekh yard in Leningrad (now St. Petersberg) between 1958 and 1984. Sixty of a planned 160 were built for the Soviet Navy by 1971 and in later years further boats were built for export to Cuba, Libya and India. Foxtrot 540 was built in 1971. These diesel electric submarines had a submerged displacement of 2,475 tons and a length of 91.3 metres. The maximum submerged speed was about 16 knots with a range of 20,000 miles at 8 knots on the surface.

In May, Foxtrot 540 was moved from Darling Harbour to the Sutherland Wharf at Cockatoo Island – the first (and quite possibly the last) Russian submarine to visit the island – for preparation for shipping to the United States. On 30 May the boat was loaded on board the German dock ship Condock IV and, after being welded to the deck of the ship and secured with wires rather like Gulliver in Lilliput the submarine left for Long Beach, California the following day.

Foxtrot 540 will be on display with the Queen Mary at Long Beach for at least five years.

Foxtrot 540 alongside Vampire in Darling Harbour - with Incat's Condor Express in the background (above) and in Condock IV (below) ready for departure (Photos by J. Jeremy)

NEWS FROM THE NORTHERN TERRITORY

Darwin has recently been host to one of the largest sport-fishing mega-yachts in the world, the MV *Obsessions*.

Owned by a media mogul in Indonesia, the craft is very impressive and measures just over 38 metres. She was built in Holland and comes complete with two 16V MTUs, which enable speeds of up to 36 knots. Her interior is dazzling, with polished walnut tables, polished marble bathrooms, gold trim fittings, plush pile carpet throughout and automatic doors from the main deck to inside. Added to that, the voyage is made extremely comfortable inside by the builder's attention to noise dampening.

In other news, the MV *Roslynne* (see ANA No. 4 page 5) is coming along, with the superstructure and bow section being recently added to the hull, after being constructed as separate modules.

HMAS *Gawler* (damaged last September in a slipping accident) is ready to go back into the water, with harbour and sea trials commencing in early July.

Samantha Tait

PROFESSIONAL NOTES

National Maritime Safety Committee

The National Marine Safety Committee, as many members will be aware, is beavering away at national maritime safety with their three working groups: Legislation and Policy, Operations and Training, and Vessel Standards and Technology.

The Vessel Standards and Technology group is working on revising sections of the Uniform Shipping Laws Code. They are currently looking at Stability (Section 8), Engineering (Section 9), Fire Safety (integrating current Sections 5F and 11), and Safety Equipment (integrating current Sections 10 and 13).

The Operations and Training Group have revised the Manning (Section 2 of the USL Code) requirements, and these are now on the internet for public comment. The National Marine Safety Committee web site is at `www.nmsc.gov.au`.

The Legislation and Policy group have possibly the most difficult task, that of getting all states to agree to all revisions to maritime safety. They are currently preparing a model for uniform legislation.

Mori Flapan has joined the NMSC secretariat as a Technical Adviser to the Vessel Standards and Technology group. Mori brings with him three years' experience with M.J. Doherty & Co., two years at Incat Designs, one and a half years at the AMECRC, and seven years at Waterways (three as senior naval architect and all as an interpreter of the USL Code), together with his recent Diploma of Law.

Phil Helmore

EDUCATION NEWS

Australian Maritime College

The first semester has come almost to an end and has been a very busy time for most of us here. Some of the notable activities that have taken place and will be taking place are as follows:

Tim Roberts from Incat Tasmania provided a very informative and intellectually stimulating lecture on the structural design aspects of wave piercing catamarans on 22 May 1998 as part of AMC/AMECRC seminar series program.

Gregor Macfarlane has undertaken an Outside Studies Program sponsored by AMC/AMECRC to conduct further research and study in the field of Wave Wake Measurement and Prediction in the Department of Ship and Marine Technology at the University of Strathclyde, UK from middle of June to September 1998.

Trevor Manwarring, a 1997 graduate of the Australian Maritime College, commenced Master,s programme in April investigating Broaching and Capsizing of Vessels in Following Seas. This work is funded by a grant from the Australian Research Council and is under the supervision of Dr. Martin Renilson.

Larissa Deck, a graduate of the Australian Maritime College, was the runner up in the National Centre for Women's *Awards for Women in Non-traditional Areas of Work and Study* in her category of Women in the Workplace Less than Five Years. She was actively supported in her endeavours by the AMECRC management.

A Fatigue Test Facility (FTF) has been set up at AMC to investigate the fatigue performance of aluminium and steel structure. Some of the principal characteristics of this machine are:

Test Cross Section: 1200x500 mm panels with stiffener arrangement

Maximum Load: 50 kN exerted by each of eight cylinders totalling 400 kN

Maximum Pressure: 640 kN/m^2

Cyclic Loads: Cycle time varying from 2 to 10 seconds

For further information on FTF Dr. Seref Aksu may be contacted on (03)-63354743 or via S.Aksu@mte.amc.edu.au. Mr. Warwick Smith MP will officially open the Fatigue Test facility on 20 July 1998.

Prasanta Sahoo

University of New South Wales

Visit by Trevor Blakeley

On Tuesday 26 May the Chief Executive of RINA, Mr. Trevor Blakeley visited the Department of Naval Architecture at UNSW. Mr. Blakeley addressed the naval architecture students on shipbuilding and ship design in the future, and the benefits that RINA has to offer students and graduates. In return, the naval architecture students entertained Mr. Blakeley to lunch with a barbecue on the lawn outside the Mechanical and Manufacturing Engineering building. Catering was ably done by the final-year students, special sauces were provided by Mark Korsten, and the drinks facilitated a full and frank interchange of ideas.

Ekranofest

The third international conference on very-high-speed marine craft was held on 15 and 16 June 1998 at UNSW. This was called *WISE up to Ekranoplan GEMs*, playing on WISE (wing-in-surface-effect) and GEM (ground-effect machines) and was designed to follow the style of previous such gatherings which have earned themselves a high reputation.

The organisers were the Institute of Marine Engineers (Sydney Branch), the Australian Maritime Engineering Cooperative Research Centre, the Department of Industry Science and Tourism, and our own Department of Naval Architecture. There were twenty-two participants, who traveled from the USA, the UK, Germany, Russia, and Japan, as well as from many parts of Australia. The proceedings contain 22 technical papers on many topics including aerodynamic and hydrodynamic efficiency, as well as navigational and safety aspects. Further information and copies of proceedings can be obtained from Lawry Doctors (02) 9385 4098 (e-mail L.Doctors@unsw.edu.au) or Laurie Prandolini (02) 9878 1914 (e-mail sbimare@msn.com).

Structural Analysis

A 2.5 day short course "First Principles Structural Design" was held on 13–15 July 1998, and an associated 2.5 day workshop "Computer-based First Principles Ship Structural Design" was held on 15–17 July

1998 at UNSW. Twenty professionals from all over Australia attended the short course, and presenters included Prof. Owen Hughes from Virginia Tech., Craig Hughes from Det Norske Veritas, and A/Prof Don Kelly and Dr Mac Chowdhury from UNSW. The who attended the workshop received hands-on experience with Prof. Hughes' structural analysis and optimisation program MAESTRO.

Undergraduate News

1998 Graduates and Prizes

At the graduation ceremony on 19 May 1998, the following people graduated with degrees in naval architecture:

Tristan Harris	H2/2
Brad Hillman	H1
Scott McErlane	
Sean Phelps	
Tauhid Rahman	H2/1
Robert Rostron	
Tim Sexton	

Some more will graduate in October when Industrial Training requirements are completed. All are now employed, but spare a thought for Scott, who has found himself a job on a 46-metre charter yacht based in Antibes, France, but spending the summer months working out of Marmaris, Turkey. It sounds like a hard life!

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

Dominic Worthington was awarded The Baird Publications Prize I for the best performance in Principles of Ship Design I;

Matthew Cleary was awarded the Baird Publications Prize II for the best performance in Ship Hydrodynamics; and

Brad Hillman was awarded both the Royal Institution of Naval Architects (Australian Division) Prize for the best Ship Design Project by a student in the final year (Brad's design was an offshore supply vessel), and the David Carment Memorial Prize and Medal for the best overall performance by a student in the final year.

Congratulations to all for their fine efforts!

Resistance in Shallow Water

Several undergraduate theses are looking at the problem of resistance prediction in shallow water. Sean Phelps started last year, with a baseline study of the deep-water resistance of a systematic series of hulls that quickly became known at the towing tank as the *Lego models* because of their connectivity. James Fenning is continuing this work by testing the same series of models in shallow water, and is now analysing the results.

Attacking the problem from another angle, it is known that the Schlichting method, while not having a sound theoretical base, predicts the shallow water resistance well at sub-critical speeds for monohull vessels for which the deep-water resistance is known. The critical speed in shallow water is at a depth Froude number ($v/\sqrt{gh}$, where h is the depth) of unity, since at this speed the wave pattern changes dramatically. David McKellar is looking at the applicability of this method to multihull vessels at sub-critical speeds and the potential for extension to super-critical speeds.

Post-graduate and other research

Resistance of High-speed Hull Forms

Tony Armstrong is completing work on his PhD thesis and should submit by the time we go to press. He has investigated the flow around a number of hull forms, including the NPL series hull form and several commercially-developed ones, using both experimental and theoretical analysis. A computational fluid dynamics software package (FLUENT) has been used extensively, and there have been some interesting findings.

Two components of resistance have been identified which have not been acknowledged before, one of which is a major component and which, on high-speed craft, can account for over 25% of the total resistance. This important finding means that the form factors for viscous resistance reduce to the expected order of 1.02, instead of 1.20 or more which have been found for many high-speed craft.

Ways of modifying the hull shape in order to change the dynamic pressure distribution around the hull form have also been investigated, so that the trim and sinkage of the vessel can be optimised in order to minimise resistance.

Economic Analysis of River Catamaran Ferries

Dr Prabhat Pal is developing a mathematical model for the preliminary design of river catamarans, considering primarily the resistance aspects to minimise shore damage due to waves created by the vessel. This will include an economic analysis to determine the principal design parameters for a ferry to operate at the minimum cost per passenger-mile. It is expected that first results will be presented at the 1st International Congress on Maritime Technological Innovations and Research, Barcelona, 21-23 April 1999.

Jumbo Container Carriers

Dr Prabhat Pal also has a study in progress on the design of jumbo container carriers (i.e. 8000 TEU and more) with special consideration of the economics of operation.

Ship Structures

Dr Mac Chowdhury is currently researching two aspects of fatigue in marine structures. The first is multilevel finite element modelling of ship structures with a view to assessing the stresses at critical details in order to carry out fatigue life assessment. The second is a study of the fatigue life, damage tolerance and residual strength of mono- and multi-hull vessels.

Phil Helmore

Curtin University

Undergraduate Activities

How can you make your Mirror dinghy sail faster upwind? This is just one of the maritime questions that three Curtin undergraduate students are currently investigating in their final year projects. The Mirror dinghy class has a certain amount of leeway within its rules for altering principal sail dimensions and shape, e.g. lengthening the jib luff.

In an attempt to reduce the amount of on-the-water testing required for sail developments, Brian Hu is conducting a parametric study utilising the vortex lattice code SVLS that determines the drive force of a sail. By systematica1ly changing the main dimensions including camber Brian hopes to determine which is the optimum sail shape for upwind performance.

Another final year student, Geoff Carter, is conducting a practical investigation into the manoeuvring of catamarans. Geoff is intending to measure the speed, position, heading and outboard thrust angle on the AMECRC experimenta1 catamaran 'Educat' during a number of different controllability tests. The measurement system that Geoff has devised comprises a DGPS, electronic compass and potentiometer (for outboard hydraulic ram measurement) which interfaces with an onboard computer for data acquisition.

Des Dunstan is continuing his study of the assessment of ride comfort of small runabouts. This semester his work has concentrated on designing the data acquisition system as well as developing a simple method of wave measurement. Des conducted an interesting experiment in Cockburn Sound comparing wave measurements from pressure wave recorders to those determined from visual estimates and wave prediction formulae based on wind speed measurements.

Postgraduate Activities

In February of this year Dougal Harris, a graduate from the Australian Maritime College, received an APA scholarship to commence study for a PhD at Curtin University. Dougal's topic of investigation is the downwind performance of yachts in waves. Much work has been conducted into the effect of waves on a yacht's upwind performance; however at present designers have no tools for determining the effect of hull and rig parameters on downwind performance in waves. Dougal aims to develop a simu1ation which models a yacht's downwind behavior due to the surging force from the waves, as well as the variation in sail force and resistance from the change in yacht speed. Experiments to validate the simu1ation wi11 be conducted at the Australian Maritime College where other following-sea investigations are being carried out under the supervision of Dr Martin Renilson.

Short Courses

Courses in Design for Small Craft, Applied Hydrodynamics, and Marine Structures and Materials are being offered in second semester. These courses are run jointly by AMECRC and the Department of Applied Physics at Curtin University.

Giles Thomas

THE INTERNET

Search Tool

Have you ever found that one search engine will not find what you are after, but that another one will? And how could you possibly know which will do the trick? *Dogpile*, found at `www.dogpile.com`, is a supra-search tool which calls up fifteen search engines and gets them *all* to search. The first ten results of each one are displayed sequentially, and you can see the sorts of things that are being found. If they are the right sort of thing then you can ask for more, or simply go on to the results found by the next search engine. [Courtesy Mori Flapan]

Advanced Computing Laboratory

Details of the Advanced Computing Laboratory for Shipbuilding at the University of New Orleans are given at `www.uno.edu/~acls`. Facilities, staffing, resources, funding, etc. are all shown. [Courtesy Trevor Rabey]

Tide Tables

Are you disappointed that BP service stations no longer supply free tide tables for the current year? Try the web-site of the National Tidal Facility at Flinders University, www.ntf.flinders.edu.au. This site will give you the tidal predictions for the current week at any primary tidal port around Australia. If you need further information, e-mail them. They can supply recorded tidal heights to the closest millimetre at six-minute intervals for primary ports. [Courtesy Phil Helmore]

U S Navy

You might be feeling that designing and building the most expensive ships in the world could be more fun than your present bread-winning tasks. If you would like to see how the US Navy's next aircraft carrier project (the CVX) is coming along then check out www.navsea.navy.mil/cvx/pubcvx.html. This site has a wealth of information about the status of the project and copies of presentations given at industry briefings. If your interest is more in destroyers, the DD21 project is widely covered on the internet. Check out http://sc21.crane.navy.mil/announce.htm. The United States has been facing many of the same challenges that we are facing in planning future major defence purchases and there is much to learn from their approaches to solving them. An interesting project is the LDP17 – the Naval Surface Warfare Center has an interesting site at http://lpd17.nswc.navy.mil/exwar.html. All these sites are very informative – Australian Department of Defence please note! [ed.]

Word97 Converter

When it introduced Word97, Microsoft all-too-quietly introduced a new format for Word documents, making them all but unreadable to earlier versions of Word. If you've decided that Bill Gates can do without your upgrade fee, then you may want to install the converter buried on Microsoft's site, at www.microsoft.com/word/freestuff/converters/wrd97cnv.htm. [Courtesy Phil Helmore]

The Royal Institution of Naval Architects

Don't forget to visit our own web site – www.rina.org.uk – you might even find The Australian Naval Architect there some time soon. Section committees should remember that it is a useful way of advertising coming events (as is a note for RINA Affairs). The editor of The Australian Naval Architect will be happy to help. [Ed.]

Australian Defence Policy for Industry

The complete text of the Defence Industry Strategic Policy Statement released by the Minister for Defence Industry, Science and Personnel, The Hon. Bronwyn Bishop MP, at the Defence Procurement Conference in Canberra on 2 June 1998 can be downloaded from the internet. Visit http://iic.spirit.net.au/Industry_Policy_Statement/home.htm. [Ed.]

MEMBERSHIP NEWS

45 Year Membership Certificates

At the Sydney Technical Meeting held on 22 July 1998 Royal Institution of Naval Architects 45 year Service Certificates were presented to a number of members of the Institution who live in New South Wales. The Certificates record the appreciation of the President, the Council and the Institution as a whole for their support over the last 45 years.

Certificates were presented to Mr. R Campbell (joined 1953), Mr. N W Cormack (joined 1953), Mr. F L Harrison (joined 1948), Mr. F B Last (joined 1949) and Cmdr. N S Stewart (joined 1953).

There are other long serving members of the Institution in Australia (like Mr. C E Sparrow who joined in 1933) who would have received their Certificates direct from London. As the Division's records only go back to the late 1950s, London has been asked to provide a list of these recipients for appropriate recognition in a future edition of the ANA.

Where the members are

At the end of June 1998 the total membership of the Australian Division was 381. The numbers in the various states and territories are ACT 28; NSW 129; NT 3; Qld. 40; SA 18; Tas. 38; Vic. 43 and WA 64. Eight members of the Division are overseas and ten have yet to advise a change of address.

Alan Mitchell

Addendum to Uses and Abuses of Marine Hydrometers

P.J. Helmore
The University of New South Wales

I have received several queries regarding Appendix B to this article (ANA April 1998). The AD correction shown there is not the same as for the Zeal draft survey hydrometers (Catalogue No. 15490) available from Edwin Bowers and Sons, Manly Vale, NSW. So, for those who would like the version for these particular hydrometers, Appendix B is reproduced here. The principle is unchanged.

Appendix B. Conversion of a Draft Survey Hydrometer Reading to a Density

As an example, assume that a draft survey hydrometer was used at an inclining experiment and gave an apparent density reading of 1.018 5 tf/m^3 (= kgf/L) at 21^{o}C. From the draft survey hydrometer calibration data, the AD correction at 21^{o}C is –0.000 1. Using Eqn (8):

$$AD = AD\ reading + AD\ correction$$

$$= 1.018\ 5 - 0.000\ 1 = 1.018\ 4\ tf/m^3$$

To convert this apparent density to a relative density use Eqn (6):

$$RD = AD + 0.002\ 0$$

$$= 1.018\ 4 + 0.002\ 0 = 1.020\ 4$$

This is the density relative to fresh water at 15^{o}C. However, to find the actual density, the effect of the density of fresh water at 15^{o}C (0.999 1 t/m^3) must be included using Eqn (4):

$$\rho = RD\ \rho_{FW}$$

$$= 1.020\ 4 \times 0.999\ 1 = 1.019\ 5\ t/m^3$$

This is the required density of the sample.

Prediction of Resistance for Ships with a Transom Stern

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Abstract

The research described in this paper relates to the practical improvement of the traditional thin-ship theory for the prediction of the resistance of a ship. In particular, we consider the important question of the transom stern, whose presence complicates the application of this theory. This paper represents a summary of research done in Australia during 1997 and the first half of 1998.

The specific improvements studied in this work include the choice of experimentally-determined factors which can be applied to the theoretical predictions. It is shown that with the use of only two such factors, one factor for the wave-resistance component and one factor for the frictional-resistance component, it is possible to reduce the root-mean-square error in the computed specific resistance from 1.5% to 0.55% for 210 tests on a series of twelve ship models.

1 Introduction

1.1 Background

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 together with a suitable formulation for the frictional-resistance component.

The difficulty has been that nonlinear and viscous-wave effects are not included and, consequently, the correlation between theory and experiment has not been sufficiently good for the practical purpose of ship design.

The methodology being promulgated here is to utilize the traditional linear wave-resistance theory in conjunction with correction factors which are obtained experimentally, because it has been shown that the linear theory predicts the *impact of changes to the hull geometry* with a very high degree of accuracy. Results in this area have been presented by Doctors and Renilson (1992), in which water-depth effects were the point of emphasis.

These principles were advanced on two fronts in the research recently presented by Doctors and Day (1997). Firstly, transom-stern effects were included in the theory by accounting for the hollow in the water behind the vessel. More importantly in the present context,

it was proven that by using only two experimentally determined factors, it was possible to obtain a very high level of correlation between the predictions and the experimental data for a large set of conditions, in terms of displacement, trim, and speed of the towing-tank catamaran model. These two factors were the (traditional) frictional-resistance form factor and a (new) wave-resistance form factor.

1.2 Current Work

In the current work, the approach is taken another step forward by utilizing a regression approach to the wave-resistance and frictional-resistance formulations over a range of twelve monohulls. Two different techniques for correcting the thin-ship theory are to be tested. In particular, a more consistent method (which correctly approaches the traditional result when the beam-to-length ratio vanishes) is examined in this present effort.

2 Experimental Investigation

2.1 Twelve Ship Models

Figure 1(a) provides the details of the hull segments from which the ship models were assembled. There was a total of seven segments. The bow and stern segments have parabolic 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. Table 1 lists the details of the so-called Lego model series. Each model had a beam B of 0.150 m and a draft T of 0.09375 m.

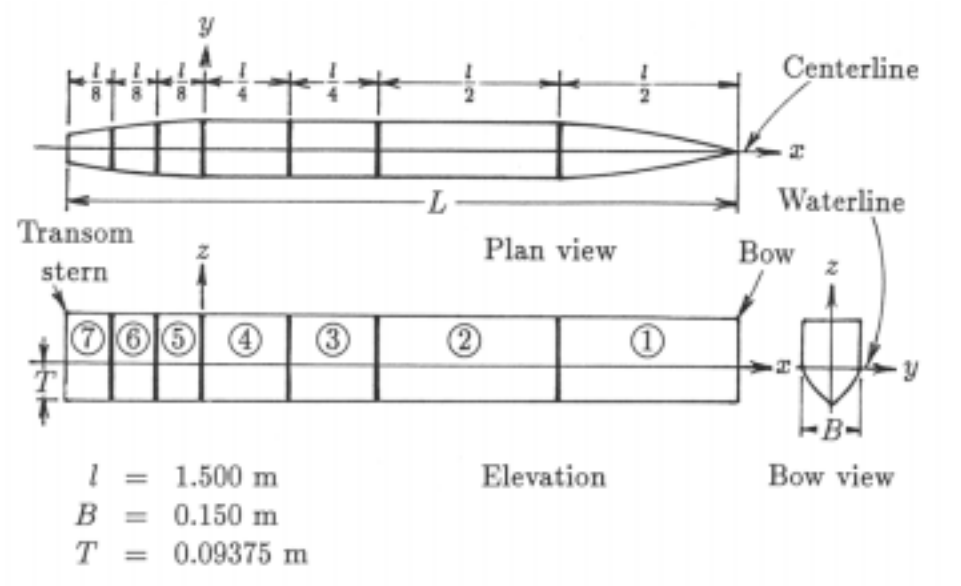

Figure 1 (a) Segments of the models

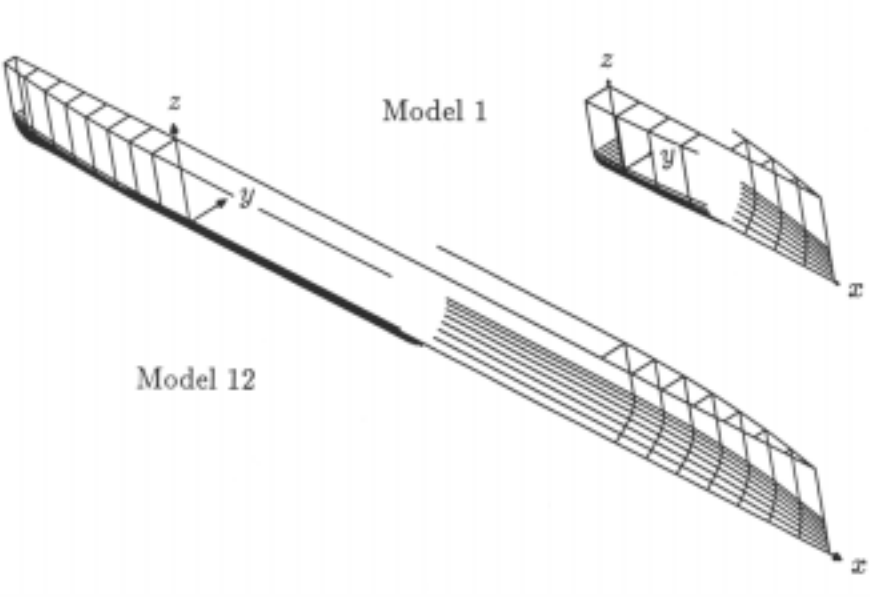

Figure 1 (b) Pictorial views of two models

Ship Model	Segments	Length L (meters)	Prismatic Coefficient C_P
1	1	0.7500	0.6666
2	15	0.9375	0.7290
3	156	1.1250	0.7499
4	1567	1.3125	0.7290
5	12	1.5000	0.8332
6	125	1.6875	0.8494
7	1256	1.8750	0.8499
8	12567	2.0625	0.8275
9	1234	2.2500	0.8888
10	12345	2.4375	0.8957
11	123456	2.6250	0.8928
12	1234567	2.8125	0.8735

Table 1: The Twelve Ship Models

2.2 Towing-Tank Tests

The twelve models were all tested by towing them over a range of steady speeds in a towing tank with a width of 3.5 m and filled to a constant depth of 1.5 m, which corresponds to a case of essentially deep water. A total of 409 runs was executed.

3 Theoretical Analysis

3.1 Michell Theory with Transom Stern

The traditional thin-ship theory was applied to the calculation of the resistance as described above. In particular, the transom-stern flow model of Doctors and Day (1997) was employed. This theoretical model takes into account the effects of the hollow in the water on the wavemaking resistance R_W, as well as the hydrostatic drag R_H on the vessel, due to the fact that the transom is assumed to "run dry".

In this pure approach, the total drag of the vessel is given by the simple summation

$$R_T = R_W + R_H + R_F + R_A \qquad (1)$$

in which R_F is the frictional resistance and R_A is a correlation allowance for the roughness, assumed to be zero for these hydraulically smooth test models.

The two parts of Figure 2 show results for the two extreme models in the series. The specific resistance, or resistance-to-weight ratio R/W, is plotted against the Froude number $F = U/\sqrt{gL}$, where g is the acceleration due to gravity and U is the speed of the vessel. The prediction of total resistance in Figure 2(a) is seen to be qualitatively correct. However, the numerical values are generally too high because of the relative fatness of this model. Furthermore, the transom-stern drag is grossly over-predicted at low speeds, since the stern should clearly be considered to be at least partly wetted. On the other hand, Figure 2(b) shows much better correlation, because both of these effects are smaller.

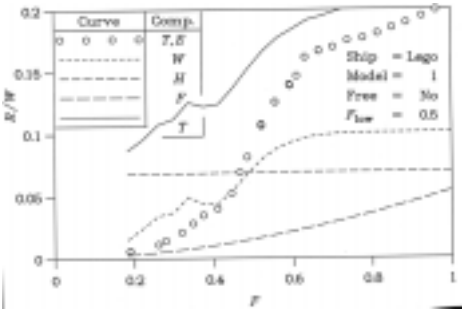

Figure 2 (a) Components of Resistance in Pure Theory - Model 1

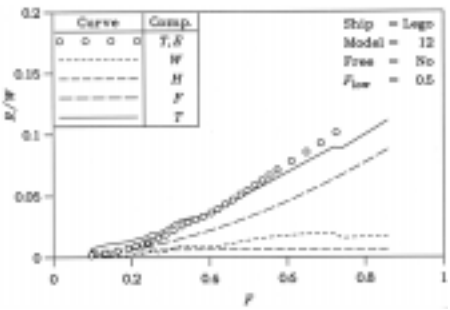

Figure 2 (b) Components of Resistance in Pure Theory - Model 12

3.2 Use of Constant Factors

The first modification to the pure theory requires the use of a *wave form factor* f_W which is applied to the computed linearized wave resistance, an idea which is analogous to that behind the traditional (frictional) form factor f_F applied to the flat-plate frictional resistance. That is:

$$R_T = f_W R_W + R_H + f_F R_F + R_A \qquad (2)$$

3.3 Use of Linear Factors

We now consider a second modification, one in which the beam-to-length ratio *B*/*L* of the model is assumed to play an important role. The assumed formulas for the form factors in Equation 2 are

$$f_W = 1 + kW(B/L), \qquad (3)$$

$$f_F = 1 + kF(B/L). \qquad (4)$$

Clearly, this approach is more attractive because the correct limit for a perfectly thin ship is accounted for.

3.4 Comparison of the Three Approaches

By way of summary, we now present a comparison of the different theories, for four representative models in the series, in Figure 3. It can be observed that in all cases there is a progressive and very worthwhile improvement with the two modifications to the theory.

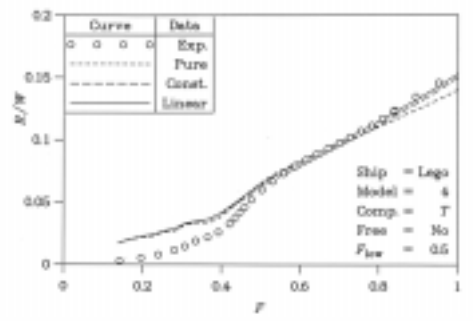

Figure 3 (a) Total Resistance - Model 4

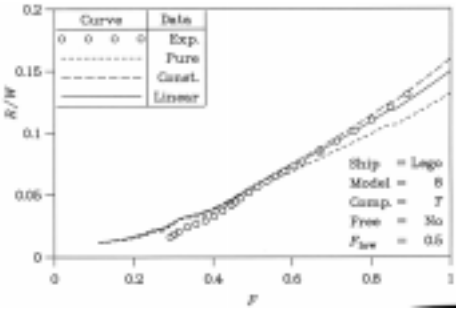

Figure 3 (b) Total Resistance - Model 8

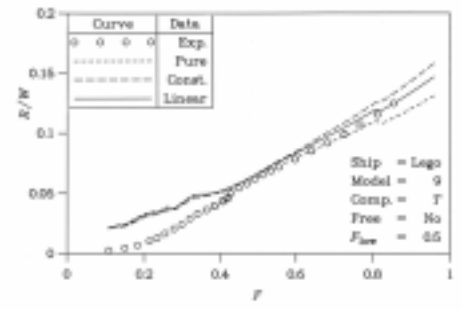

Figure 3 (c) Total Resistance - Model 9

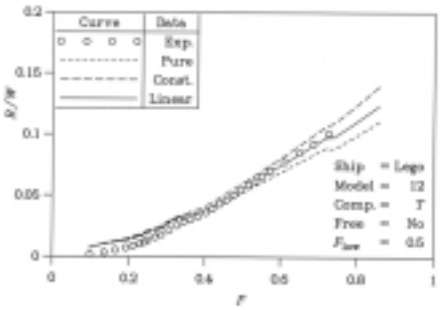

Figure 3 (d) Total Resistance - Model 12

4 Conclusions

The work presented here illustrates the fact that considerable gains in accuracy of the traditional wave-resistance theory can be achieved by rather straightforward modifications to the traditional concept of summation of the resistance components. Table 2 summarizes these improvements by way of the root-mean-square error in the specific total resistance R_T/W for the series.

Theory	Optimal Wave Form Factor f_W	Optimal Frictional Form Factor f_F	Root-Mean-Square Error in Specific Total Resistance e_{RMS}
Pure†	1.0000	1.0000	1.5420%
Constant	0.5593	1.4170	0.7514%
Linear‡	0.7023	1.3408	0.5511%

† The form factors are not optional here
‡ The form factors are here calculated at $B/L = 0.1$

Table 2: Summary for the Three Implementations

It is clear that there is still considerable scope for further improvement in the correlation between the predictions and the experimental data. It is therefore planned to add some further sophistication to the two form factors.

Future work will also include a better modelling of the partially-wetted transom stern, applicable at low speeds.

5 Acknowledgments

The author would like to express his appreciation to Mr G. Macfarlane of the Australian Maritime College (AMC) in Launceston, Tasmania, for his considerable assistance with running of the towing-tank experiments.

6 References

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

FROM THE ARCHIVES

This photograph of a ship entering the water at the State Dockyard in Newcastle was taken in February 1964. It was a significant event in Australian shipbuilding history - do you know why? Answer in the next ANA. (Photo by John Jeremy)

THE ROYAL INSTITUTION OF NAVAL ARCHITECTS
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STOP PRESS

ANOTHER INCAT SHIP RECORD

Cat-Link V, Incat Australia's latest 91 metre wave piecing catamaran, has established a new record for the fastest transatlantic crossing in a ship, despite participating in the search for a light aircraft ditched mid Atlantic.

Cat-Link V broke the two world records set in June 1998 by another Incat ship *Catalonia*, namely:

- Steaming 1,018.5 nautical miles in 24 hours (previous best 1,015 nm)
- Achieving a 41.284 knot average speed over more than 2,800 nm (previous record 38.877 knots)

Cat-Link V left Australia's southern most city, Hobart, in late June 1998 and after a long voyage, via the Pacific - Panama Canal - Caribbean Sea, arrived in New York on the 14 July 1998. After taking on over 500 tonnes of fuel and provisions *Cat-Link V* sailed with a VIP send-off from New York Harbour. The ship passed the official starting line, Nantucket Light, at 06.08.42 (UTC) on Friday 17 July at 40 knots**.**

In the first twelve hours steaming *Cat-Link V* averaged 38.6 knots. By Saturday morning (the second day) the ship speed was up to 43 knots and the voyage average stood at 40.28 knots. *Cat-Link V* then received a relayed MAYDAY message from Rescue Control Centre, Halifax advising all shipping to keep a sharp lookout for a ditched single engine aircraft whose last reported position, some 40 hours earlier, was nearby. Captain Claus Kristensen reported the ship's current position and notified RCC Halifax that *Cat-Link V* was proceeding to the last reported position. On board tension grew about 10 nautical miles short of the position when something was sighted in the water - closer investigation revealed a long line buoy. *Cat-Link V* proceeded through the area on a NE course.

Two hours later a rescue plane told the ship of debris that had been sighted some 30 nautical miles behind. *Cat-Link V* was asked to turnaround - towards New York - and proceed immediately to the area. After an hour the *Cat-Link V* crew located the smoke flare dropped by the aircraft and the debris. Crew member Soren Kristensen donned an immersion suit and went over the side to recover a 500 mm^3 block of foam and a 370 mm long plastic cylinder. Later, about 1 nautical mile from this position *Cat-Link V* also recovered a fishing buoy. All debris was unrelated to the missing aircraft and having searched the area for some time *Cat-Link V* went to the turn around point where she was relieved of search and rescue duties by RCC Halifax. Tragically, there are still no clues as to the fate of the occupants of the plane.

Day 3 weather conditions were not favourable - 30 knot winds and sea on the beam. Engine rpm was reduced to preserve fuel and the speed, with 770 nm still to travel, was 40.5 knots.

The weather finally turned for the better with 130 miles to go and the record was in sight. *Cat-Link V* crossed the finish line - Bishops Rock, UK - travelling at 47.6 knots, at 02.17.42 UTC on Monday 20 July.

Post-crossing discussions with the Hales Trustees confirmed that the distance logged during the search and rescue operation was to be added to the Nantucket Buoy - Bishop Rock distance. The voyage distance was easy to calculate as a careful log was kept throughout the crossing using the on-board DGPS, accurate to within 3 metres, together with independent observation and logging by other passing ships and rescue aircraft. When divided by the total elapsed time it resulted in a remarkable **41.284 knots average speed** - bettering the previous record by 2.4 knots.

A photograph of *Cat-Link V* appears on page 17.

Steve Thurlow
Incat Australia