THE AUSTRALIAN NAVAL ARCHITECT

Volume 12 Number 3
August 2008

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Journal of

The Royal Institution of Naval Architects (Australian Division)

Volume 12 Number 3
August 2008

Cover Photo:

The first of two 47.5 m passenger ferries being built for New World First Ferry at Austal's shipyard in Margate, Tasmania.
(Photo courtesy Austal Ships)

The Australian Naval Architect is published four times per year. All correspondence and advertising should be sent to:

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The deadline for the next edition of *The Australian Naval Architect* (Vol. 12 No. 4, November 2008) is Friday 24 October 2008.

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The Australian Naval Architect
ISSN 1441-0125
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Print Post Approved PP 606811/00009
Printed by B E E Printmail
Telephone (02) 9437 6917

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From the Division President

In 2010 we will be celebrating 150 years of the Royal Institution of Naval Architects. This date also coincides with the 50th anniversary of the supplemental charter granting the Institution the title 'Royal' in its name. The original Institution was established in 1860 and has progressed from a learned Institution for naval architects in the United Kingdom to the international Institution we all know today. In the May 2008 edition of *RINA Affairs*, readers will have noticed a call from the Chief Executive for suggestions to mark this occasion. One suggestion involves capturing a record of the past and publishing this in a book. The purpose is to give credit to those who shaped our industry and helped us get to where we are today. With this in mind, I think it is important that we, in Australia, also record our past and describe major events that have shaped Australian industry. There is a number of significant events that will need to be recorded, perhaps in articles in *The Australian Naval Architect* during 2010. I would like to suggest a few of those significant events and start the ball rolling by asking for more suggestions.

First and foremost must be the history of the RINA within Australia. Back in 1947 a group of like-minded naval architects in Sydney decided to form an association of naval architects and in 1954 this association became affiliated with RINA to become the Australian Branch. It was not until 1979 that the Australian Branch became the first international Division of RINA. A detailed record of the history of the RINA in Australia can be found in the February 2004 edition of *The ANA*.

Whilst on the topic of *The ANA*, it was back in March 1997 that *The ANA* was produced for the first time. Many of us may remember the A5 document when it first arrived in the post. Credit must be given to Kim Klaka and the team that put the first journal together and ultimately to John Jeremy and Phil Helmore for developing *The ANA* into the journal we have today.

The education of naval architects within Australia is also important. If any of us are asked today where naval architects are trained we will probably say the University of New South Wales and the Australian Maritime College which is associated with the University of Tasmania. The Australian Maritime College was officially opened in 1980 to meet the needs of seafaring education in Australia. It was not until 1985 that AMC first introduced degree courses and a year later a Bachelor of Engineering (Maritime) appears with its first batch of students. Three years later this course included an optional stream in naval architecture and has grown from strength to strength. I'm sure a similar story could be written outlining the development of the program at the University of New South Wales.

Research organisations also have major milestones which have influenced our industry. In 1993 the Ship Structures and Materials Division of DSTO was formed. The division was responsible for accessing acquisitions, advising on construction and materials, and extending the life of all defence platforms. The focus was clearly shifting to include applied scientific activities. Later on, the division changed its name to become the Maritime Platforms Division. Another research organisation which played an important role within Australia was the Australian Maritime Engineering CRC. Although this organisation was closed after a seven-year life, many of the links and relationships developed through the AME CRC are still active today.

Australia is well known worldwide for its contribution to the high-speed craft industry. The Tasman Bridge collapse in 1975 is often mentioned as the event that led to the formation of the Sullivan's Cove Ferry Company which transported passengers between the eastern and western shores of Hobart. It was the experienced gained in the understanding of passenger requirements that led to the formation of International Catamarans and, ultimately, to the company we know today. One of its major achievements for Australia was the winning of the Hales trophy for the fastest crossings of hte North Atlantic by a passenger vessel by *Hoverspeed Great Britain*, *Catalonia*, and (still holding the record) *Cat Link V*. On the other side of the continent Austal can claim its place in history by building the world's largest commercial trimaran.

There are plenty of other examples of significant events that have shaped our industry's past. Another example could be the closure of the Commonwealth shipyards. I would like to invite you to send in suggestions about events that need to be researched and recorded so that these can be included in a historical record.

An important event such as this also needs to collect the thoughts of those visionaries who can describe the challenges of the future. Once these are recorded we can plan the pathway to solve these challenges and make sure our industry is as strong in the future as it is today. Who should we turn to in order to collect these thoughts? Similarly, who were the naval architects who shaped the past within Australia — should we ask them for their view if they are still with us?

Hopefully this has caused you to start thinking about what has shaped our industry and who we should call upon to record it. Please pass any suggestions you have to me through Keith Adams.

Stuart Cannon

Editorial

One can't help feeling sympathy for the US Navy's planners. Hard on the heels of the cancellation of the second two of the competing LCS prototypes comes the news that only two of the DDG1000-class ships will be built. These advanced ships will be very different to anything which has preceded them but their large size (14 000 t displacement) and high cost (some $US3 billion each) has meant the end of the plan to build seven of the class. Even that number had already been greatly reduced from the thirty or so originally planned. It is back to the drawing board for the US Navy after many years of research and technology development.

It is a rather familiar story to those of us who can remember the RAN's plans in the late 1960s to build up to twenty small light destroyers (DDL). As the design developed the ships grew in size and complexity. The number fell to six and then to only three by the time the DDL was cancelled in 1973. The project to design destroyers specifically for the RAN had become too big, risky and expensive, particularly as off-the-shelf alternatives with similar capability were available. After a further review of the options, the RAN finally accepted the US-designed FFG7-class guided missile frigate as the DDL replacement. The US Navy does not have as wide a choice and it will be interesting to see how the challenge is met.

John Jeremy

Letters to the Editor

Dear Sir,

I suggest that it is time for naval architects to have a substantial re-think on how to calculate the strength of sailing yachts. Traditionally it has been assumed that the greatest loadings on the hull are due to waves and, for the keel, the worst case has usually been the 90° knockdown with a factor added for dynamic effects. These are no longer the worst likely cases; two additional cases need to be included. First, grounding on the keel at full speed and, secondly, collision with a floating object (usually a whale or sunfish). Whilst these two events have always been possibilities, their rate of incidence appears to have increased dramatically over the last five years or so.

Firstly, consider the grounding event. I suggest that this has occurred at roughly the same frequency over the last 50 years (though I have little evidence to support that statement). What has changed is the boat speed at which the groundings occur, for perhaps two reasons — increased size of boats over the years and increased speed potential for a given size. Whereas, 30 years ago, a grounding would rarely occur at more than 7 kn boat speed, we now hear of groundings at 9 kn or more — roughly double the impact load. So the impact loads can no longer be accommodated by what might be called "engineering design slack" in the conventional lateral bending-moment calculation. A longitudinal bending moment must also be considered.

Secondly, consider the whale collision likelihood and consequence. The number of whales in the ocean is increasing dramatically from precariously low numbers, thanks to long-overdue conservation measures — many species are still endangered, so please don't offer culling as a solution! Anecdotal evidence shows that the rate of whale collisions increasing (e.g. the recent Quebec–St Malo race) but has not, to my limited knowledge, been quantified yet. Here is a first attempt — in a typical trans-ocean race or rally with 20 yachts, about two yachts will hit a semi-submerged object. 20 yachts over 2000 miles = 40 000 miles for two incidents = 20 000 yacht-miles sailing per collision. Reality check: 200 miles offshore race along the coast of Australia, about 1 collision every other race, 30 boats per race = 12 000 yacht-miles of sailing per collision. The discrepancy is probably due to the greater density of whales migrating up and down our coasts compared with the open ocean. So a boat can expect to hit a whale once every 10 000–20 000 miles of sailing. That is not much different from the likelihood of experiencing a design wave impact or a knockdown. The consequences of collision tend to be more severe so, on a risk analysis, we appear to be ignoring events that are more serious than a design wave or a knockdown.

These two simplistic analyses suggest to me that naval architects need to re-think the basis for their structural calculations — is there anyone else who agrees? I would be very interested to hear from both supporters and dissenters. Our group at Curtin University is well placed to look into whale collisions — we know quite a bit about whales as well as yachts — but we need help from others, particularly those with expertise in structures, if we are to examine this in depth.

There is a third problem with existing strength calculations which I will leave to the materials specialists. Many structural failures now occur in benign conditions, usually some hours or days after the yacht has survived rough conditions unscathed. This suggests that the failure mechanism of the material is time-dependent, with a substantial lag between extreme load and structural failure. What particularly puzzles me is that this time-lag phenomenon is displayed by many different structures and many different materials — aluminium spars, carbon-fibre rudder stocks, FRP sandwich bow sections etc. What is going on?

Kim Klaka

Curtin University

Dear Sir,

According to *The Naval Architect* (May 2007, Page 3) one of the greatest limits on the European shipbuilding industry is a trend towards labour shortages and a lack of young engineers entering the sector. My experience studying naval architecture at the University of New South Wales leads me to conclude that there seems to be such a trend here too.

While engineering in general is considered to be an unpopular degree to study, what is most interesting is that aerospace engineering seems to be enjoying entry levels almost an order of magnitude higher than those of naval architecture. I find this to be contrary to common sense, as Australia doesn't exactly have a thriving aerospace industry and the job prospects for aerospace graduates don't compare to what is virtually guaranteed to a successful naval architecture graduate. This leads me to contemplate the possible reasons behind the discrepancy of interest in the aerospace engineering and naval architecture disciplines.

The best answer I have found, as to why naval architecture is not such a popular degree, I have encountered again and again when introducing myself to people. More specifically, my answer to the "So… what do you study?" question has always been followed by "What on earth is that and how did you get into it?"

To be honest I, myself, had never heard of naval architecture until I had begun my first year at university studying mechatronics, and it was later that I transferred into the degree.

While the small class sizes and state of the naval architecture job market certainly suits me now, I wonder how the lack of public awareness will affect the industry in the long term.

Tibor Corbett

UNSW Student

Dear Sir,

The human factor in vessel design has become an important topic, but is usually considered in relation to the operation and the operators of a vessel. Seldom are the human elements of the design process considered, which should greatly concern us as naval architects. Surely, the potential consequences of a master navigating a vessel onto a reef are just as serious as if a naval architect designs a vessel with insufficient structure, for example. An error can vary from creating an over- or under-sized part to overlooking a critical element of the fit-out. Both scenarios may have a significant cost associated with them and thus we must strive to avoid them.

The chief cause of errors — in my view — is the pressure of time and cost. This also depends on the size of the consultancy as well as the availability of checking and consultation. The pressure is heightened for a smaller consultancy, where there may be more pressure for high throughput, designers are responsible for a greater range of tasks, and there are fewer people to check the work. I have had the opportunity of doing some of my industrial training with a design consultancy in New Zealand which, despite being a highly professional and competent design office, was occasionally prone to errors due to its small size and high turnover.

Something which surprises me when I look at many consultancies is the range of design software being used. Most often, there are several different programs utilised, since many designers wish to make use of particular features of some programs which others may not have. This may lead to modelling the hull in one program, doing structural calculations in another, and designing the pipework in another. Not only does this require operators to learn many different programs — thus increasing their charge-out rate — but it also increases the chances of an error, since the commands and techniques may differ from program to program. In any case, this is simply a result of different companies developing different software, but I believe it would be highly beneficial for someone to develop a software package which combines the various features which consultancies find most useful.

Perhaps the most prevalent source of errors is the communication during the design process. This can include communication within the design office, between the designer and client, or between the designer and the builder. The best way to minimise communication errors is to have methods of interaction between the different parties in the design which are as clear and concise as possible. The best designs are often agreed upon by the use of a comprehensive written brief and specifications, as verbal agreements often result in misunderstandings. Naval architects have become adept at working with the builder and adapting designs to suit their interests as well, and this is important to ensure that there is acceptance of responsibility throughout the design chain.

The human input required in design makes it inevitable that there will be errors made at some points. The only thing one can do is to attempt to minimise these errors. To do this I believe organisations, more especially smaller ones, need to make sure that the procedures they use are as fail-safe as possible, making use of habitual checking, peer review, and experience to improve their performance. It is imperative to attempt to find and eliminate mistakes early, before they compound and become a big problem later on.

Toby Austin-Fraser
UNSW Student

NEWS FROM THE SECTIONS

ACT

The ACT Section's Annual General Meeting was held on Tuesday 17 June at the Campbell Park Offices of the Department of Defence. Mr Dan Curtis (Chair) thanked all those who had participated and contributed over the last 12 months and summarised the sections activities.

The notable activities of the ACT section over the last 12 months included the hosting of the Australian Division AGM on Tuesday 19 March at the Campbell Park Offices, The meeting was followed by a presentation by Mr John Jeremy titled *The Twenty First Century Passenger Ship — Queen Mary 2.*

The following ACT Section committee members were elected:

Chair	John Colquhoun
Deputy Chair	Peter Hayes
Secretary	Glen Seeley
Treasurer	Tim Lyon
Members	Joe Cole
	Dan Curtis
	Lindsay Emmett
	Rob Gehling
	Kerry Johnson
	Ian Laverock

Division Council Representative
Ian Laverock

The ACT committee is continuing to develop a presentation plan including the LHD and AWD projects, Naval Ship Code, and operation of the AMSA Emergency Towage Vessel (ETV).

Roger Duffield

South Australia and Northern Territory Section

Following recent approval by the Council of the Australian Division of RINA for the formation of the South Australia and Northern Territory Section of RINA, the first committee meeting was held at the Port Dock Brewery Hotel on 28 May 2008.

At the meeting, the following committee membership positions were agreed:

Chair	Ruben Spyker
Deputy Chair	Graham Watson
Secretary/Treasurer	Peter Crosby
Members	Neil Cormack
	Adam Podlezanski
Junior Member Representative	Sam Baghurst

The focus for the Committee is now to promote the SA and NT Section to the naval architects in the state and territory to ensure that we have a large, lively and representative RINA Section in Adelaide. With the increasing focus on Defence in South Australia, and in particular on the submarines and air-warfare-destroyer projects, the formation of a SA and NT Section of RINA is timely and welcome.

My thanks go to Peter Crosby for undertaking the legwork to get the section formed and up and running. We look forward to increasing the contribution to *The ANA* from our Section members.

Ruben Spyker
Chair, SA and NT Section

Adam Podlezanski, Ruben Spyker, Neil Cormack, Sam Baghurst, Graham Watson and Peter Crosby at the inaugural meeting of the SA and NT Section Committee at the Port Dock Brewery Hotel (Photo courtesy Ruben Spyker)

New South Wales

Committee Meetings

The NSW Section Committee met on 26 May and, other than routine matters, discussed:

- SMIX Bash 2008: Sponsorship levels the same as previous years; silent auction and raffle to be conducted and proceeds to the SHF; new SHF caterers to be contacted for quote; credit-card facilities to be continued.
- TM Program: Ted van Bronswijk, of the Company of Master Mariners of Australia, has booked Alston Kennerley to make a special technical presentation to CMMA, RINA, IMarEST and the Nautical Institute at the NSW Sports Club on 19 August on *The Four-masted Barque,* Passat.
- Committee membership: ongoing.

The NSW Section Committee also met on 21 July and, other than routine matters, discussed:

- SMIX Bash 2008: Quote received from new SHF caterers; ticket prices set at $30 for early-bird and $35 thereafter; model for silent auction decided and lines plan obtained; invoicing of sponsors has commenced and some payments already received.
- Relations with EA: Chair met with representatives of Engineers Australia, and they will list our TMs in their weekly email and monthly journal *Engineers Sydney*, and link to RINA on their website under Learned Groups>Technical Societies>See All Technical Societies [*This has now been done* — Ed.]
- Committee membership: ongoing.
- Report on AD Council Meeting: Report received (see separate report in the *Membership* column).

The next meeting of the NSW Section Committee is scheduled for 2 September.

Class Societies and the Safety Case

Michael Mechanicos, Senior Manager Naval Services for Germanischer Lloyd in Sydney, gave a presentation on *The Role of Classification in a Safety Case Regime* to a joint meeting with the IMarEST attended by 25 on 4 June in the Harricks Auditorium at Engineers Australia, Chatswood.

Introduction

Mike began his presentation with a few words about his career, which began with two-and-a-half years as a seaman in the merchant navy, and then 22 years with the Department of Defence, working in project management and, more recently, as Director of Navy Certification.

This was followed by photos of some famous disasters, including *Piper Alpha* and *Herald of Free Enterprise.* In the last 30 years, following a number of major accidents such as these, safety management has undergone considerable change. It was realised that safety is not just an engineering issue, but also has management and operational dimensions. Investigations into accidents found that the existing prescriptive regulations were insufficient to ensure the safety of modern complex systems.

More holistic risk-based safety-management arrangements, where the responsibility of managing safety lies with the owner/operator, were recommended, and legislation embodying these recommendations was progressively introduced. Employers are now required to provide — and maintain — a safe work place, free of risk for their employees and the public. In a number of industries, the submission of a safety case by the owner/operator is compulsory.

A number of navies around the world adopted the safety case in their regulatory systems to improve their safety management regime. At the same time the involvement of classification societies in naval business, offering classification services, is continuously increasing. There is some confusion about the relationship of classification to the safety case, given that the former is viewed as a prescriptive system, whilst the latter adopts a goal-based approach.

The Safety Case: What is it?

The safety case is a documented body of evidence which provides a convincing and valid argument that a system is adequately safe for a given application in a given environment.

What does "adequately safe" mean? A working definition is that the (residual) safety risks are either broadly acceptable or tolerable, and as low as reasonably practicable (ALARP). A risk is ALARP when it has been demonstrated that the cost of any further risk reduction is grossly disproportionate to the benefit obtained from that risk reduction. The cost includes the loss of capability as well as financial or other resource costs. The ALARP region depends on the acceptable safety objectives of the organisation/state/industry and, clearly, may vary from one to the other.

So, the safety case is a comprehensive and integrated risk-management tool which demonstrates how safety has been considered with regard to any system or equipment throughout the life of capability from definition through to disposal. It can also be used for risks other than safety, such as mission and environmental risks.

It covers not only technical, but also operational, management and support aspects. It is a through-life living document, updated and authorised at regular intervals *and* after changes to either requirements or systems.

Classification: What is it?

Classification is a process by which independent assurance is given that a ship or system has been designed, built and maintained to a set of approved rules which have been shown to provide an acceptable level of safety and environmental compliance.

It involves a set of rules, developed and owned by a classification society, and a regime of independent reviews, surveys, audits, examinations and tests throughout the life cycle of the ship. It also involves selection of appropriate design and build standards, design appraisal to ensure compliance with selected standards, facility approval, subcontractor approval, procedure approval, certification of materials (including consumables), surveyor authorisation, surveys during build to ensure compliance with design and construction standards, certification of equipment, equipment installation and setting-to-work tests, harbour and sea trials, in-service surveys, approval of repairs and alterations and, finally, feedback for the continuous improvement of the rules.

Issues

The safety case requires evidence that the risk associated with the capability have been identified and reduced to tolerable levels and are ALARP. There is a question as to whether the rules of classification societies reduce risks to the ALARP level. The operational concept assumed for their development might be different to the one for the capability under consideration. The rationale behind their development is generally unknown, and so their use in new designs might introduce unforeseen risks.

They are limited in scope, as they ignore the human aspects of operations. They promote a culture of compliance: the designer and the operator need only comply with a rule, and there is no incentive to further improve safety.

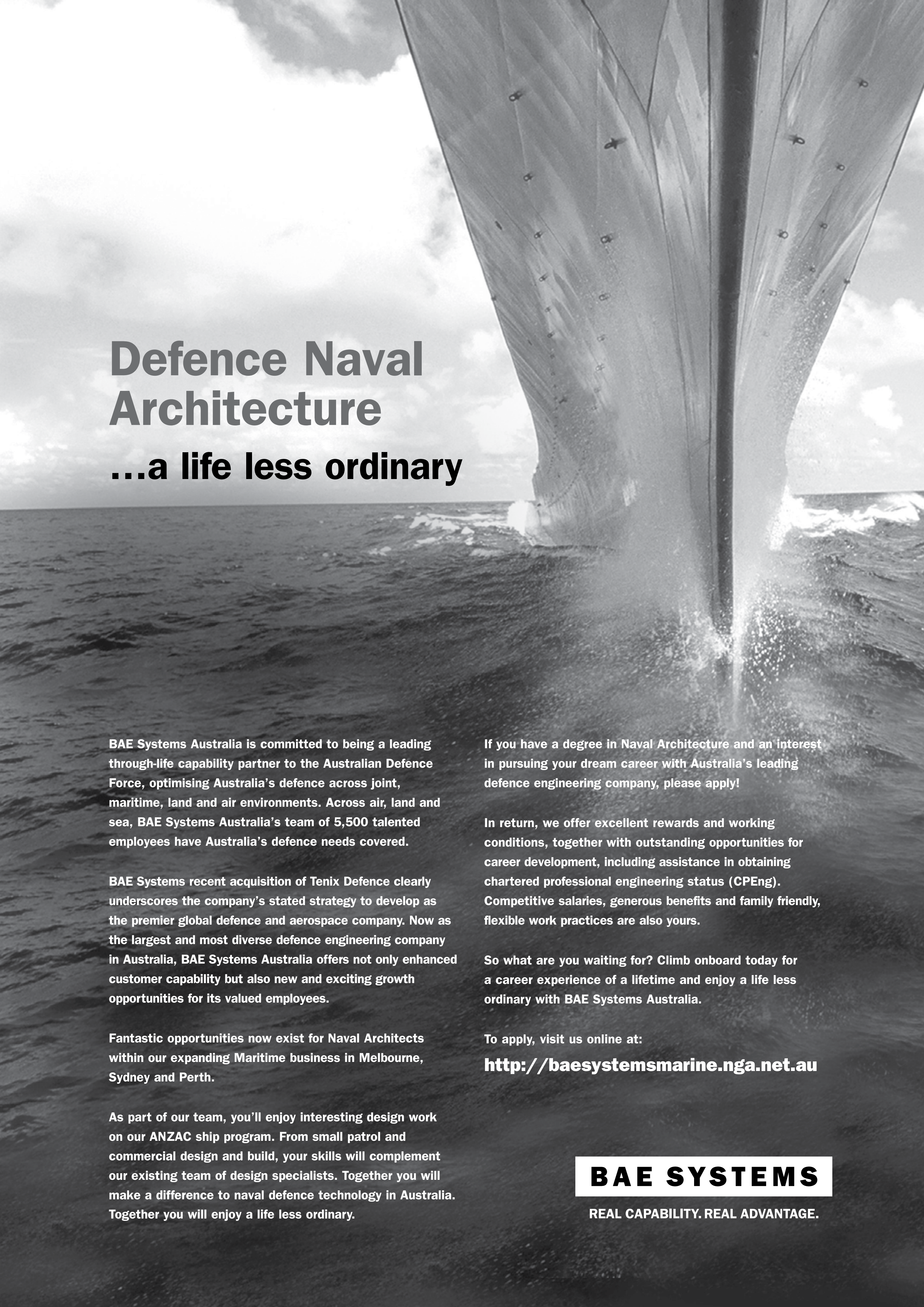
They have generally been developed in response to accidents, rather than for their prevention. The classification societies are, in general, slow in adopting new technologies, and they represent a minimalist approach to safety.

However, against that, prescriptive regulations embody years of experience and research. They provide a uniform set of standards with which industry is familiar, and which ensure that acceptable levels of safety, reliability and interoperability are attained. Discarding them altogether is not recommended. In fact, there are cases where such prescriptive regulations are very appropriate.

In addition, not all requirements are prescriptive. Equivalent arrangements incorporating new technologies and innovative solutions are allowed.

Formal Safety Assessment (FSA) has been adopted by classification societies and the International Maritime Organization (IMO) in the development of rules and regulations. FSA identifies the risks addressed by the rules, and assists in demonstrating ALARP by compliance.

Work undertaken by the classification societies has showed


Defence Naval Architecture
...a life less ordinary
BAE Systems Australia is committed to being a leading through-life capability partner to the Australian Defence Force, optimising Australia's defence across joint, maritime, land and air environments. Across air, land and sea, BAE Systems Australia's team of 5,500 talented employees have Australia's defence needs covered.
BAE Systems recent acquisition of Tenix Defence clearly underscores the company's stated strategy to develop as the premier global defence and aerospace company. Now as the largest and most diverse defence engineering company in Australia, BAE Systems Australia offers not only enhanced customer capability but also new and exciting growth opportunities for its valued employees.
Fantastic opportunities now exist for Naval Architects within our expanding Maritime business in Melbourne, Sydney and Perth.
As part of our team, you'll enjoy interesting design work on our ANZAC ship program. From small patrol and commercial design and build, your skills will complement our existing team of design specialists. Together you will make a difference to naval defence technology in Australia. Together you will enjoy a life less ordinary.
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that, for mature systems, classification has brought the risks into the tolerable and broadly-acceptable regions. Reverse engineering the existing rules to verify ALARP is proving very costly. Demonstration of ALARP can be difficult because of the nature of the judgments involved.

It is now accepted that the use of appropriate standards, codes and good practices could be used as evidence for ALARP. A number of industries use certification against industry-approved standards as evidence for ALARP. Classification is therefore certification, and is considered good practice in the marine industry.

How they fit Together

Classification therefore is a part of the safety case! Combined together, they provide an effective regulatory tool.

To further improve the system requires careful selection of rules to reflect the operational concept of the capability, understanding the extent of the classification, if required (especially for new designs) performing further analysis to achieve ALARP, ensuring that the final set of requirements is coherent, and work closely with the classification society.

Remember that the safety case still needs to cover non-class systems, operational, logistic-support and safety-management issues.

Benefits

Classification can provide a significant contribution to requirements of the safety case. There is no need to "re-invent the wheel", and experience gained over the years is captured and used effectively. Industry is familiar with the process, and so there can be savings in both time and cost.

Conclusion

Classification is a robust well-proven process. It includes experience and lessons learnt over the last 200 years. It provides effective mitigation against a considerable number of risks, and provides a large amount of the evidence required to mount a convincing safety argument. To reap the benefits of classification, prudent selection and application of the rules is required.

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

Hydrofoils for Canting-keel Yachts

Phil Helmore, Naval Architecture Plan Coordinator at the University of New South Wales, gave a presentation on *Hydrofoils Applied to Canting-keel Yachts* to a joint meeting with the IMarEST attended by 23 on 2 July in the Harricks Auditorium at Engineers Australia, Chatswood.

Phil's presentation was originally presented at the Pacific 2008 International Maritime Conference at Darling Harbour in January, and the written paper from that conference is reproduced elsewhere in this issue.

The vote of thanks was proposed, and the "thank you" bottle of wine presented, by RINA Fellow and former President of IMarEST worldwide, Alan Taylor.

Fire and Composites

Zenka Mathys, of the Maritime Platforms Division of the Defence Science and Technology Organisation, gave a presentation on *Fire Resistance and Flammability Issues for Composite Structures* to a joint meeting with the IMarEST attended by 25 on 6 August in the Harricks Auditorium at Engineers Australia, Chatswood.

Introduction

Zenka began her presentation with a review of composites, which are increasingly being used in marine and transport operations because of their light weight for both structural and non-structural applications, and she showed pictures of examples, including the LPD17, DDG1000, etc. However, light weight is not the only advantage of composite structures, although that advantage can be considerable. They also have high corrosion and chemical resistance, high specific (i.e. per unit mass) mechanical properties, impart design flexibility and, generally, reduce life-cycle costs. Despite these advantages, composites also have disadvantages, and their performance in fire is not generally favourable.

Meeting Requirements

Vessels have to meet fire-safety requirements, and the most important of these are the IMO SOLAS and HSC Code requirements. In the view of the classification societies, composites can be used in vessels, but the overall structure must meet the stringent SOLAS or HSC Code requirements.

Composites are flammable, and we therefore need to determine the potential risk associated with their use in order to ensure the safe escape of people in the event of fire.

Here she showed a graph depicting the temperature as a function of time following the start of a fire, and a standard time-temperature curve which closely follows measured values in the growth and spread areas of the data.

Fire Reaction

Fire reaction is the response of a material to a fire. The IMO's HSC Code classes composites as combustible materials and sets out stringent requirements for the acceptability of materials.

One of the tests which can verify acceptability is the large-scale Room Burn/Corner Test in accordance with ISO 9705, which requires the materials to withstand 100 kW for 10 min, then 300 kW for 10 min, a total of 20 min. The products used in the test must be in their "end use" and "as installed" conditions, i.e. replicating exactly the "as fitted" condition on board.

DSTO has conducted this type of test on a phenolic PVC-cored sandwich panel for a fast ferry. There was no flashover, and minimum spread of the fire, but the panels failed the test because the amount of smoke generated exceeded the standard's requirements. If fire insulation, or even a smoke-retardant paint had been used, then the panels would probably have passed. Interestingly, the aluminium bars which had been used to secure the panels in place in the corner ended up as molten puddles on the deck, while the composites survived!

Conducting such large-scale room-corner tests is expensive. One alternative is to use cone calorimetry in order to screen materials for three properties: ignition, rate of heat release, and effect of heat on combustion. This has been used to test differing resin systems, including expoxy, vinylester, polyester and isophthalic resins. A graph of rates of heat release vs time for these resins showed that they mostly have similar rates, but that epoxy resins have a very high peak rate. In general, the rate of heat release (RHR) is high for a resin on its own, but this decreases to one-third of that rate in a laminate, and it takes longer to ignite.

The USA's specification MIL-STD-2031 for the use of composites in submarines specifies the use of cone-calorimetry tests. However, only the phenolic resins come close to meeting this standard.

Fire Resistance

Fire resistance is the ability of a structure or material to prevent the spread of a fully-developed fire from one compartment to another. Fire resistance is usually determined in a furnace test, and the criteria are to prevent the passage of smoke and flame for a given period of time, and to minimise the temperature rise of the unexposed surface. Here she showed a graph of temperature vs time on the unexposed surface, approaching the limiting temperature asymptotically.

The US Navy is moving to use a hydrocarbon N-series curve, simulating the fire(s) resulting from missile hits. USS *Stark* was hit by two Exocet missiles, and suffered large fires as a result. The US Naval Research Laboratory performed subsequent flashover fire tests on USS *Shadwell*, and determined that the resulting temperatures are more typical of a hydrocarbon N-series curve than of a cellulosic curve. The hydrocarbon N-series curve has a temperature of 1200°C and a faster temperature rise that the cellulosic curve, which has a temperature of 950°C.

A fire on board the GRP vessel HMS *Ledbury* in 1983 burned for 6 h, and aluminium brackets melted in the affected compartments. However, the GRP structure contained the heat, and there was no spread of fire to other compartments.

In tests done by DSTO, phenolic resin PVC foam-cored test panels failed the IMO tests at 27 min, so the panels themselves require insulation from fire. A marine-grade aluminium panel subjected to the same test failed after 10 min, and burned through after 30 min, where the composite panel did not burn through.

The fire performance of composite materials and structures can be significantly improved with the use of thermal barriers. For example, an inspection panel with 20 mm of microtherm insulation meets the 60 min test.

Structural Integrity

Steel is presumed to be load bearing in all relevant fire conditions, and is tested against IMO Resolution A754(18).

Aluminium is required to meet IMO Resolution MSC45(65) for A-class load-bearing divisions — in addition to A754(18) — but, unfortunately, loses its strength at elevated temperatures. One of the requirements is that there should be no core temperature rise of 200°C at any time.

Composites are also required to meet IMO Resolution A754(18), but the resolution states that the Administration should specify the acceptable temperature rise. The material should prevent the passage of flame and smoke for a given time, and maintain the load-carrying capability for a given time. A material fails the test when it is no longer able to support the test load, and failure is determined by the maximum deflection and the rate of deflection. DSTO has conducted a thermo-mechanical evaluation of a full-scale test set-up.

Modelling

Large-scale fire testing is expensive. For modelling of the

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load-carrying ability of composite structures during fire, several areas need to be addressed. There is the thermal modelling of the fire itself, and the mechanical modelling of the structure by both analytical and finite-element techniques. Development of combined thermal-mechanical models would be useful tools for the analysis of fire resistance.

Conclusion

For shipboard use, composites need to meet the IMO requirements for fire reaction, fire resistance, and structural integrity. In general, composites can be used (and advantage taken of their useful properties) in association with a thermal barrier.

Questions

Question time was lengthy, lasting for nearly half an hour, and elicited some further interesting points.

When the fire-safety provisions of the NSCV were being drafted, the issue of intumescent (i.e. swelling-up with heat) paints was considered but not adopted because of concern that these may degrade with time. DSTO has done small-scale testing with these paints, but the testing needs to be expanded for better conclusions.

DSTO has also done some work with the US Office of Naval Research on carbon composites. It is envisaged, but yet to be proved that, because carbon is black, composites using carbon may get hotter (and possibly more quickly).

Fire-retardant additives (in composites) are related to the fire-reaction times (for ignition and the rate of heat release), but not to the thermal-barrier time.

Different core materials (as opposed to different thicknesses) also influence the results. The density of the core also has an effect; higher core densities give better results. As an example, on one test done by DSTO, they laid up one sandwich test panel with two half-thickness cores because of availability, and the infusion had an (unintended) layer of phenolic resin between the two core layers. In the test, the fire burned through the outer skin and the first half layer, but stopped at the middle resin layer, thus improving the performance.

There is some concern over the use of thick sections as, if there is an established fire, then there is a build-up of heat in the compartment, promoting re-ignition if the compartment is opened soon after extinction of the fire. This can be a real problem because, in this case, boundary cooling is ineffective.

One problem for the classification societies is to find approved products. For steel and aluminium, only a few tests are required in order to approve a range of constructions. However, with composites there is a range of reinforcing materials, a range of resins, and a range of cores, all of which can be combined in many ways. Many tests are therefore required. Cone calorimetry can predict the fire-reaction properties, but not the structural-integrity properties.

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

Phil Helmore

COMING EVENTS

NSW Technical Meetings

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

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

3 Sept	Adrian Broadbent, Lloyd's Register Asia *Classification of the RAN's New Navantia-designed LHDs*
24 Sept	Sandy Day, The Universities of Glasgow and Strathclyde *Current and Future Trends in Tank Testing in Naval Architecture and Ocean Engineering* (at University of NSW; 5:30 for 6:00 pm; see details below)
1 Oct	Eric Clarke, MAN Diesel *51/60 Dual Fuel Engines for LNG tankers*
4 Dec	SMIX Bash 2008

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

WA Technical Meetings

Members in Western Australia receive regular notice of joint meetings with IMarEst in the West Coast Bulletin. The tentative program for the remainder of 2008 is as follows:

17 Sept	Nick D'Adamo, Regional Program office of UNESCO *Programs of the Perth Office of the Intergovernmental Oceanographic Commission*
15 Oct	Nigel Gee, Past President of RINA, and Daniel Veen, student at Curtin University *Smoothed Particle Hydrodynamics*
19 Nov	LCDR Arran Melville, RAN *Overview of the Anzac Systems Program Office at Rockingham*

Trends in Tank Testing

Dr Sandy Day, Manager of the Acre road Hydrodynamics Laboratory at the Universities of Glasgow and Strathclyde, will make a special technical presentation *Current and Future Trends in Tank Testing in Naval Architecture and Ocean Engineering* to the combined institutions, RINA (NSW Section) and IMarEST (Sydney Branch), on Wednesday 24 September.

The capability of numerical codes for prediction of flow around ships and other engineering structures is increasing steadily; computational fluid dynamics (CFD) analysis is now routinely used in the ship hull-design process, and in many aspects of ocean engineering, reducing and, in some cases, eliminating some tests which would previously have been carried out in towing tanks. In this context, the future role of tank testing in Naval Architecture and Ocean Engineering will be discussed, covering some key developments in facility and instrumentation technologies, data-analysis

SMIX

…the Sydney Maritime Industry Xmas Bash is on again! Thursday 4 December, 1730 hours for 1800, onboard the iron barque "James Craig" berthed at No 7 Darling Harbour.

Photo courtesy of ANMM

PS: Don't spoil your copy of the Australian Naval Architect – photocopy the coupon instead

Those wishing to attend the Sydney Maritime Industry Christmas Bash (SMIX) should complete this form and return it, together with your remittance, to the RINA (NSW) Treasurer, Adrian Broadbent, c/o Lloyd's Register Asia, PO Box Q385, Sydney NSW 1230 or Fax (02) 9290 1445.

Price: $30:00 per person for Early Birds – before 3rd November 2008; or $35:00 per person after 3rd November. No refunds will be granted.

Name: (Block Letters) ______________________________

Guests: ______________________________

____

Cheque payable to "Royal Institution of Naval Architects (NSW Section)" for __________ is enclosed.

Or please charge my MasterCard ☐ or Visa ☐ (please tick relevant box)

Credit Card payments can only be used for Early Bird bookings and MUST be received before 3rd November 2008.

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Attention: Adrian Broadbent, Lloyd's Register Asia
PO Box Q385
Sydney NSW 1230 or Fax (02) 9290 1445

techniques, experiment types, and new applications.

Dr Sandy Day manages the Acre Road Hydrodynamics Laboratory in Glasgow, and is involved in a wide variety of commercial and research testing projects. He has been a member of the International Towing Tank Conference (ITTC) Resistance Committee since 2002.

The venue is Room 101 in the School of Mechanical and Manufacturing Engineering at the University of New South Wales, Kensington, at 5:30 for 6:00 pm. If you plan to attend, then please let Phil Helmore know on (02) 9385 5215 so that we can cater for you.

Ausmarine 2008

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

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

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

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

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

HPYD 2008

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

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

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

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

SMIX Bash 2008

The ninth SMIX (Sydney Marine Industry Christmas) Bash will be held on Thursday 4 December aboard the beautifully-restored *James Craig* alongside Wharf 7, Darling Harbour, from 1730 to 2130. This party for the whole marine industry is organised jointly by RINA (NSW Section) and IMarEST (Sydney Branch).

Tickets are available from Adrian Broadbent of Lloyd's Register Asia on (02) 9262 1424, fax 9290 1445. Cost is $30 per head till 3 November and payments by credit card are acceptable till then. After 3 November, the cost is $35 per head and credit card payments are no longer acceptable; cash or cheque (payable to RINA NSW Section) only. There is a limit of 225 guests on *James Craig*, so it would be wise to book early.

For further details and booking form, see the advertisement elsewhere in this issue.

IHSMV 2009

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

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

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

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

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

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

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

Students at IHSMV 2009

The IHSMV 2009 conference will have a limited number of free places available for students who are not able to present a paper at the conference — first in best dressed, so be quick! Contact Ms Yuen Yee Pang at ypang@rina.org.uk, or fax +44-20-7259 5912.

The Royal Institution of Naval Architects

INTERNATIONAL CONFERENCE ON INNOVATION IN HIGH SPEED MARINE VESSELS

28-29 Jan 2009, Fremantle, Australia.

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Curtin University of Technology

First Announcement & Call for Papers

Curtin University of Technology
Centre for Marine Science & Technology

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

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- Safety, Regulation and Classification
- Equipment

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CLASSIFICATION SOCIETY NEWS

LR Classes World's Largest LNG Vessel

International gas shipping entered a new era recently when the world's largest LNG vessel —classed by Lloyd's Register — was named in front of a huge crowd of dignitaries at Samsung Heavy Industry's (SHI) massive shipyard on Geoje Island, South Korea. Ordered and to be operated by the Qatar Gas Transport Company (Nakilat), the first "Q-Max"-sized vessel, *Mozah*, with a capacity for 266 000 m^3 of LNG, will carry almost 80 per cent more cargo than conventional ships. These new models are expected to spearhead long-haul gas shipping to the United States and Europe as the industrialised world continues its search for cleaner energy products.

"We are very proud to have been involved in the design and construction of these revolutionary new vessels, which are destined to make a cleaner form of energy available to more of the world's consumers," David Moorhouse, Chairman of the Lloyd's Register Group, said at the naming ceremony. "As the classification society of choice for nine of the first 10 Q-Max LNG vessels — including the very first — this project further enhances Lloyd's Register's reputation as a technology leader in this important and growing sector."

The Q-Max model ("Q" for Qatar and "Max" for the maximum size of ship able to dock at the LNG terminals in Qatar) features slow-speed diesel engines which are more fuel efficient and thermally efficient than steam turbines, resulting in about a 30% reduction in overall emissions. In short, they represent a cleaner way to safely transport cleaner energy.

The improved economies of scale inherent in the much larger comparative load capacity are also expected to reduce shipping costs — which typically have accounted for about one-third of the price of LNG — by about 30%.

Andy Richardson, Shipping Project Manager for the Qatargas Operating Company Ltd, said that improving the industry's strong performance record for safety, quality, operability and maintainability was at the forefront of his team's thinking throughout the conception, design and construction stages for these innovative vessels, and their smaller "Q-Flex" sister ships, which were previously the world's largest.

"The adoption of new technology after rigorous qualification processes allowed significant economies of scale to be achieved," Mr Richardson said. "Redundant, highly-efficient propulsion systems and onboard reliquefaction have realised operational efficiencies and a reduction in emissions. We believe that these changes will provide meaningful benefits to all within the customer supplier chain, forever changing the traditional paradigm of LNG transportation."

"With 45 of these new-generation vessels contracted for delivery from the three leading Korean yards, co-operation and team work has been an essential ingredient for success," he said. "We have valued the continuous support of Lloyd's Register in meeting the challenges we set, and I am extremely proud of what has been achieved."

Lloyd's Register is the world's leading classification society for LNG vessels with 39% of the existing fleet under its class, a proportion that is destined to grow with the delivery of the new Q-Maxes in the next two years. In all, 14 Q-Max and 31 Q-Flex sized LNG ships have been ordered from the big three Korean shipbuilders by Qatari interests and their partners, 17 of which will be built to Lloyd's Register class.

Glenn Cobb

World's First Tanker Built to Common Structural Rules

Lloyd's Register EMEA has commemorated the delivery of the world's first tanker built to the Common Structural Rules (CSR) for the Dubai-based ETA Star Group. To mark the delivery, John Curley, Lloyd's Register EMEA's Senior Vice President, Marine, for Middle East and Africa, presented a certificate to Syed M. Salahuddin, Managing Director of ETA Star Group, at an event in Dubai on July 17.

The 183 m, 51 069 t deadweight, double-hull oil tanker, *Abu Dhabi Star,* was built at STX Shipyard in South Korea and delivered to ETA Star Group on February 25, 2008. At the presentation ceremony, Curley said, "Lloyd's Register is honoured to have delivered the first CSR tanker into the ETA fleet. This certificate presentation is a significant milestone in the development of CSR tankers".

The Common Structural Rules for tankers and bulk carriers, based on global best technical practice and aimed at creating a new generation of more robust and safer ships, were unanimously adopted by the International Association of Classification Societies (IACS) Council for implementation on April 1, 2006.

ETA Director, Ahmad Al Ghurair, said: "Shipping is, undoubtedly, among the more dynamic industries, which requires ship owners and operators to be proactive and come forward to ensure compliance with international rules and regulations. We are committed to upgrading and maintaining our fleet to meeting the highest standards of the industry."

Ameer Faisal, Executive Director of ETA's Shipping Division, said: "We, at the Shipping Division, are very excited to have the first vessel built under CSR and are proud to be associated with Lloyd's Register, whose commitment to quality and safety is well known. This demonstrates our commitment to be amongst the first when it comes to compliance with international requirements. In fact, these vessels were ordered long before the actual compliance deadline for CSR implementation."

Abu Dhabi Star is the first of four CSR tankers to be delivered to the ETA Star Group by STX. The group already operates and manages a fleet of 35 oil tankers and bulk carriers, and has a newbuilding order book for a further 40 ships, equivalent to 3.7 Mt dwt.

LR Press Release, 22 July 2008

Hormuz Clocks 56 Knots

The second of Austal's two 65 m vehicle-passenger ferries built for the Sultanate of Oman has become the first diesel-powered vehicle ferry to reach a speed of 56 knots.

Hormuz recorded a maximum speed of 56 kn and a service speed of 52 kn during sea trials held near Henderson in Western Australia in early July.

The feat makes her the fastest diesel-powered vehicle passenger ferry in the world — a title previously held by her sister vessel *Shinas*, which recorded a maximum speed of 55.9 kn last year.

The vessel is scheduled for delivery to Oman in August, where she will join *Shinas* in providing a new tourism service to Oman's spectacular Musandam Peninsular as flagships of the Sultanate's expanded marine-transport network.

The unrivalled performance of the two 65 m vehicle-passenger catamaran ferries showcases the world-class ability of the Austal design team, who successfully developed a new, customised, high-efficiency hull design capable of delivering record-breaking performance, while Austal's construction team managed to meet demanding weight targets.

Austal currently has 15 commercial and defence vessels operating in the Middle East, as well as 10 in nearby Turkey, reinforcing Austal's commitment to the unique needs of the region.

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

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

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

France Buys Shipyard Stake

In June, France announced plans to buy back 9 percent of the country's biggest shipyard.

Chantiers de l'Atlantique in western France, which built *Queen Mary 2*, was sold by French engineering firm Alstom to Norwegian shipbuilder Aker Yards in 2006. But a controlling 39 percent stake in the Norwegian company was transferred to South Korea's STX Shipbuilding a year later, raising concerns in France over the future of 3000 shipbuilding jobs in the country.

Alstom, which had owned the shipyard since the 1970s, sold 75 percent of Chantiers de l'Atlantique to Aker Yards in January 2006, citing financial losses. It kept 25 percent with an option to sell in 2010.

HMAS *Anzac* launches an Evolved SeaSparrow missile during the sea phase of RIMPAC 2008
(RAN Photograph)

Australian Innovation to Drive Defence Capability

Australian companies and universities will share $21.5 million in the latest round of defence-capability development funding, the Minister for Defence Science and Personnel, the Hon. Warren Snowdon MP announced on 20 June.

"It is widely acknowledged that Australian industry plays a key role in supporting our Defence operations. So I am pleased to announce today that 12 innovative proposals have been selected for further development under the Capability and Technology Demonstrator Program."

"The CTD program provides opportunities to show how advanced technology can provide significant enhancement to Defence capability. These 12 projects come from various industry sectors, and include small-to-medium enterprises, established defence contractors and Australian universities.

"It is exciting to see that the proposals receiving funding in 2008 cover a very wide spectrum of defence capability — from wearable solar panels to submarine sonar, from grenade launchers to GPS anti-jam units.

"The projects are a mix of leading-edge technologies and innovative applications of existing technologies, with the potential to result in major savings for Defence, spin-offs for civilian use and export opportunities for Australian industry," said Mr Snowdon.

The Capability and Technology Demonstrator Program supports priority defence-capability development by funding Australian industry to trial new technology. The work informs Defence of the potential performance and technical risks associated with future implementation.

The Defence Science and Technology Organisation manages the CTD Program on behalf of Defence.

HMAS *Toowoomba* tests MU90

The Hon. Joel Fitzgibbon, Minister for Defence, announced on 22 June that the Defence Materiel Organisation had successfully test fired the new MU90 lightweight anti-submarine warfare torpedo the previous week.

"While the MU90 lightweight torpedo has been successfully tested in Europe, this acceptance test and evaluation exercise represents the first time an MU90 lightweight torpedo has been fired from an Australian warship," Mr Fitzgibbon said.

The MU90 lightweight ASW torpedo being launched from HMAS *Toowoomba* off Western Australia (RAN Photograph)

Mr Fitzgibbon said that the test firing from HMAS *Toowoomba* at sea in the Western Australian Exercise Area approximately 30 km off Mandurah in Western Australia was a milestone for the DMO's Joint Project 2070, Project Djimindi — Replacement Lightweight ASW Torpedo.

"The new MU90 lightweight torpedo will provide a significant upgrade to the anti-submarine warfare capabilities of the surface combatant ships of the Royal Australian Navy, including the RAN's FFG and Anzac frigates," Mr Fitzgibbon said.

The MU90 lightweight torpedo is being acquired in a three-phase program worth $616 million at January 2008 prices. Defence selected the Eurotorp MU90/Impact torpedo in 1999 after a competitive tender.

The MU90 lightweight ASW Torpedo is 3 m long, weighs 300 kilograms, has a range of greater than 10 km and is designed to track and attack quiet-running submarines at depths to more than 1000 m.

New Role for Well-known Incat Ship

SpeedFerries, the English Channel's family-owned low-cost ferry operator, has purchased the 86 m wave-piercing catamaran *SpeedOne* from Incat.

SpeedFerries entered the market with a new low-cost model in May 2004, launching sailings between Dover and Boulogne with *SpeedOne* on charter from Incat. Since then SpeedFerries has had a dramatic effect on the cross-Channel ferry market, as the average price of car tickets on the Dover Strait has reduced dramatically, benefiting all cross-Channel travellers.

The vessel which began life as Incat 045 must be one of the most well-known high-speed craft to be built by Incat. In military and commercial service, as HMAS *Jervis Bay* and later as *SpeedOne*, the vessel has never been far from media attention.

In May 1999 she was chartered at short notice by the Royal Australian Navy and ,over the next two years as HMAS *Jervis Bay,* she became pivotal in the initial deployment of Australian and other contingents to East Timor, being initially assigned to the International Force — East Timor (INTERFET). She was the first naval vessel to berth alongside the Dili wharf, when on 21 September 1999 several hundred Australian troops were disembarked. During her five-month stint with INTERFET HMAS *Jervis Bay* conducted three

The Sultanate of Oman's record-breaking 65 m vehicle-passenger catamaran *Shinas* arrived in Muscat, Oman in early June following her 15-day journey from Austal's shipyard in Henderson, Western Australia. The vessel made the journey under her own power, making scheduled stops at the Cocos Islands and Male in the Maldives (Photo Courtesy Austal Ships)

Incat 045 in civilian colours as *SpeedOne*
(Photo Courtesy Incat)

trips per week, operating a 430 n miles route across the Timor Sea between Darwin and Dili, a high operational tempo that was sustained by a two-crew system.

During this time, HMAS *Jervis Bay* attracted the attention of worldwide military forces, demonstrating the potential of high-speed craft to perform various military roles. The resulting overwhelming interest from US Forces in high-speed craft ultimately led to the deployment of three Incat wave-piercing catamarans in US service.

With the cessation of INTERFET, the craft continued to support Australian forces operating in East Timor under Operation Tanager before completing her last passage, the 107th voyage, on Anzac Day in 2001. In all, HMAS *Jervis Bay* had sailed just under 100 000 n miles, carried in excess of 22 000 'passengers', 450 vehicles and 5000 t of stores and humanitarian aid.

Returning to commercial operation in 2002, Incat 045 left Australia for Italy where she operated for a season on charter. At the end of the season she was moved to the British port of Portland for lay-up pending sale or charter. She was then chartered by SpeedFerries and renamed *SpeedOne* for the historic link between Dover and Boulogne, where she quickly claimed an impressive 12% of the highly-competitive passenger vehicle market.

Just 18 months after the service was launched, SpeedFerries won the "Best European Crossing Operator" award in 2005 at the UK Daily Telegraph Travel Awards. By the second anniversary of SpeedFerries' launch, *SpeedOne* had carried more than one million passengers and close to 500 000 cars.

Liberty Ship Milestone

On 8 July the Liberty ship *Arthur M. Huddell* was towed from the US James River Reserve Fleet. She was the 72nd ship to depart the James River site since January 2001. *Huddell* is the last of the Liberty ships in the US National Defense Reserve Fleet. She was towed to the W3 Marine facility in Norfolk, where preparations will be made to transfer the ship to Greece. Greek authorities plan to turn her into a museum.

www.marinelink.com

Queensland Industry News

The Gold Coast marine industry is experiencing steady activity despite the current perceived economic blues. A reduction in sales at the Sanctuary Cove Boat Show in May has not deterred most of the local production-boat builders from travelling south to showcase their latest models at the Sydney Boat Show. At the show, Riviera launched a total of six new models but centre stage will be their much-anticipated Riviera 70, featuring four cabins, four bathrooms and power by twin 1119 kW engines. Maritimo Offshore will be presenting their new Cabriolet 60 which is the first of their sport cruiser models. Local sailing catamaran companies Perry Catamarans and Lightwave Yachts are experiencing solid orders which probably reflect the increasing cost of fuel.

Most local builders are being kept busy with refit work. Of note was the BIA award presented to Marine Engineering Consultants for the Refit of the Year Award. The Gold Coast City Marina tenant was recognised for their major refit of the motor yacht *Dreamtime*.

Local naval architecture company Oceanic Yacht Design has a number of new designs underway, including an all-aluminium 41 m high-speed passenger ferry, as well as a 17 m dive-charter power catamaran. Sea Transport Solutions also has a number of large jobs at the moment including a 140 m general cargo and utility vessel for a UAE client, two 35 m pusher catamaran tugs and six 130 m dumb barges.

Futuristic Materials Centre Established

The development of futuristic materials for use in ships, aircraft and combat vehicles is now a reality, with the establishment of the Defence Materials Technology Centre (DMTC).

The Minister for Defence Science and Personnel, the Hon. Warren Snowdon MP, the Minister for Innovation, Industry, Science and Research, Senator the Hon. Kim Carr, and the Parliamentary Secretary for Defence Procurement, the Hon. Greg Combet AM MP, announced in June that the DMTC is incorporated and ready to start.

"The DMTC is the first centre of its kind, and will bring together some of Australia's brightest talents in the field of materials technology research," said Mr Snowdon.

"Participants such as Bluescope Steel, BAE Systems, Thales Australia, GKN Aerospace, Surface Technology Coatings, ANSTO, Wollongong University and Queensland University have been unstinting in their commitment and co-operation."

A board of directors has been elected, and Dr Mark Hodge has been appointed as Chief Executive Officer, with effect from 30 June. The DMTC officially commenced operations on 10 June on the signing of the Commonwealth Agreement, and opened its doors at the beginning of July.

Mr Combet said that the Centre will play a vital role in the protection of Australian troops deployed around the world.

"The DMTC will be headquartered at Swinburne University and will receive Australian Government funding of $30 million and a further $52 million from the collaborative partners," said Mr Combet.

"Its program is designed to develop specific future defence capabilities not currently addressed by Australian defence industry. I look forward to it delivering improved armour protection for military vehicles and high-tech materials for use in major Defence acquisitions such as the Joint Strike Fighter."

The DMTC is the first to be established under the Defence Future Capability Technology Centre Program, modelled on the Government's successful Cooperative Research Centres (CRC) Program.

"The decision to emulate the CRC Program — which is now in its seventeenth year — in the delivery of this new initiative is testament to the value of the program," Senator Carr said.

"It is absolutely essential that we have innovation programs and infrastructure which can solve the widest range of problems – social and environmental, as well as economic," he said.

The DMTC will be managed by the Innovation portfolio. With 13 partners from Government, industry and the research sector, the Centre's establishment is on schedule, making it the shortest timeframe for an organisation of this nature to be established.

Austal Submits Final JHSV Proposal to US Navy

Austal submitted its final Phase II Joint High Speed Vessel (JHSV) submission to the US Navy at the end of July, following an extensive detailed design and review process. Austal was one of three bidders awarded a Phase I contract in January and it is anticipated that a single Phase II contract will be awarded in late 2008 for the construction of up to ten ships.

The Austal JHSV Team's low-risk, proven technology solution combines the expertise of Austal USA, Austal Ships (Australia) and General Dynamics Advanced Information Systems (GDAIS). This team is able to provide proven design-and-construction experience of commercially-based high-speed vessels in the USA and the integration of military computing environments.

The JHSV program is a joint effort between the Army and Navy to acquire high-speed vessels for the two branches of the US military. JHSV will be used for fast intra-theatre transportation of troops, military vehicles and equipment.

"Once delivered, the Joint High Speed Vessel will be a key component of the US military's expeditionary warfare capability," said Rear Admiral Charles Goddard, Program Executive Officer for Ships. "This high-speed transport will carry soldiers or marines, with their gear, to harbours that would normally be unusable by conventional maritime assets."

Austal USA's Mobile, Alabama shipyard is unique in having the proven infrastructure and trained workforce in place to design, construct, deliver and service over 100 m high-speed ships in the US. Austal USA recently launched the 127 m trimaran *Independence* (LCS2) for the US Navy and has under construction the second 107 m Hawaii Superferry catamaran high-speed vehicle-passenger ferry. In 2007 Austal USA delivered the first Hawaii Superferry *Alakai* for intra-island service in the Hawaiian Islands.

Austal was recently awarded a new contract to provide additional features and equipment on the second Hawaii Superferry to facilitate its use by the military. This follows on from the long-term charter, since 2001, of the Austal built 101 m vehicle-passenger catamaran *WestPac Express* by the III Marine Expeditionary Force (MEF) based on Okinawa, Japan. As an adapted commercial vessel, *WestPac Express* has demonstrated the enormous flexibility, cost savings and efficiencies achievable by commercial fast-ferry technology over conventional air or sea transport.

Sonar for Air-warfare Destroyers

On 11 August the Minister for Defence, the Hon. Joel Fitzgibbon MP, congratulated the Air Warfare Destroyer (AWD) Alliance in achieving an important milestone in the AWD project with the selection of Ultra Electronics as the preferred supplier of the sonar system for the AWDs.

"I would like to take this opportunity to congratulate Ultra Electronics for being selected to supply this key capability for Australia's future AWDs," Mr Fitzgibbon said.

Following a rigorous tender process, Mr Fitzgibbon was advised by the CEO of the Defence Materiel Organisation (DMO), Dr Stephen Gumley, and the Chief of the Capability Development Group, Vice Admiral Matt Tripovich, that the selection of Ultra Electronics will ensure that the AWDs are equipped with a sonar system which provides excellent anti-submarine and torpedo defence capability.

"The selection of the sonar system is a key milestone for the AWD Alliance and represents the first of a series of important equipment selections that the team will make in the next few months," Mr Fitzgibbon said.

"I also note that Ultra Electronics has committed to undertake more than 50% of its AWD sonar systems work in Australia, which represents a great result for Australian Industry."

The AWD Alliance will shortly be issuing Requests for Tender to selected companies for work on the ships' hull blocks, as well as work on other elements of the ships' combat systems.

As one of the largest and most complex defence acquisition programs currently underway in Australia, Mr Fitzgibbon said that the Government was closely monitoring the progress of the AWD project and the AWD Alliance.

The AWD Alliance includes DMO, Raytheon Australia and the Australian Submarine Corporation.

Government Supports Thales' Skilling for the Future

On 11 July, Greg Combet, Parliamentary Secretary for Defence Procurement, announced Australian Government support in the order of $3.1 million for training activities at Thales Australia.

"Under an agreement drawn up through the Skilling Australia's Defence Industry (SADI) program, Thales has committed to upskilling a total of 2325 staff over the next three years," said Mr Combet.

"Defence firms face stiff competition for skills which are in strong demand in highly-profitable sectors, such as mining and energy.

"The SADI initiative shares the responsibility for skills growth and development between industry and government, with a view to addressing the unique character of many defence-relevant skills, and the rising demand associated with the ongoing modernisation and expansion of the Australian Defence Force's capability.

"Thales is one of Australia's largest defence contractors and is currently contracted to deliver against 28 Defence land, sea and air contracts.

"This new agreement represents a joint commitment on the part of Defence and Thales to spend over $18 million on defence-specific professional and technical training activities.

"Australian Government support through the SADI program will deliver an almost five-fold increase in the level of training undertaken by Thales Australia, which is more than fifteen hundred additional places over and above their normal training activity," said Mr Combet.

"Under the SADI scheme, the Australian Government provides financial support for the direct costs of training which, in this instance, accounts for 17 per cent of the total commitment.

"The Thales agreement is the 47th SADI Agreement to be signed and, to date, the Australian Government has committed a total of $27.6 million from program funds.

Mr Combet said "The Government remains strongly committed to supporting the efforts of the defence industry to combat the skills crisis."

Austal Installs 250th Water Jet

Austal has been congratulated by Rolls-Royce Australia following the installation of its 250th Rolls-Royce / Kamewa water jet during June. With Austal currently celebrating its 20th year, the milestone reinforces the company's extensive experience in working with advanced marine technology. The achievement also underlines the strength of Austal's long-term relationship with Rolls-Royce, in which Austal is the waterjet manufacturer's leading customer for fast ferry applications.

The Kamewa 63 SII water jet, one of the most popular in the Rolls-Royce range due to its efficient conversion of engine power to thrust for the ship, was installed on Austal's latest 47.5 m passenger catamaran ferry being built for Hong Kong — the 46th fast ferry which Austal has built for the region.

More than 200 Austal vessels currently operate worldwide, many of which have incorporated the Kamewa 63 SII unit.

Hong Kong's Venetian Marketing Services Limited (VMSL) ordered a total fleet of fourteen 47.5 m passenger ferries, each driven by four Kamewa water jets. The passenger catamarans will capitalise on the rapidly-growing demand for the Hong Kong-to-Macao service, currently the world's largest route in terms of passenger numbers.

Seven of the vessels have already begun operation between Hong Kong and Macau, where their performance has stood out during commercial service.

Managing Director of Rolls-Royce Marine Australia, Doug Brice, and James Bennett, Austal Commercial Sales Manager, with the 250th water jet
(Photo courtesy Austal Ships)

New HQ for Strategic Marine

As well as expanding their shipyards, Strategic Marine's Henderson, WA, headquarters is about to undergo renovations which will see the construction of a new shed and a smart new office complex.

Henderson General Manager, Paul Cook, said that the 22 m wide by 40 m long shed would have a total floor area of just over 1000 m^2. "It will have about a 15 m space underneath the crane, so it's quite a substantial internal volume," said Paul.

"The concrete slab for that has been laid, and we are in the final stages of getting the building licence to erect the shed. It's about a ten-week build program, depending on the weather," he said.

The company currently leases a shed from LandCorp, but is now planning to move its production from the leased facility back onto its own site.

The shed will be used to construct a large order for commercial and military aluminium vessels.

Paul said that the new office complex, which will be located in the company's current car park, will house both the Strategic Marine and Avenger Yachts headquarters.

"It will have 1000 m^2 of floor space and, at this stage, we're planning on a two-storey building.

"That will be at least a 12-month project — possibly longer. We have development approval from the council, but we have yet to finalise the design or settle on a builder," he said.

New South Wales Industry News

24 m Catamaran Workboat from Incat Crowther

Incat Crowther has been selected by Offshore Unlimited to design a 24 m catamaran workboat which is to be built at the new Richardson Devine Marine facility in Hobart, Tasmania. The design will be based on Incat Crowther's recent successes in catamaran workboat design, utilising their high carrying-capacity hullforms and capitalising on their experience in developing durable aluminium structures.

The new vessel will be a high-speed catamaran workboat, capable of carrying 50 t of deadweight at a service speed of 26 kn. The main deck, which will have a carrying capacity of 24 t, will be arranged for multiple uses and will include a moonpool for exploration services and the ability to carry a 20 ft container. The deck will be serviced by a Heila deck crane capable of lifting 3.5 t. The main accommodation block is located forward and contains space for a crew of 10. The main deck cabin houses the galley and crew mess area, along with two crew cabins for the senior crew. Wash facilities are also located on this deck, with one accommodating laundry facilities. Junior crew cabins are located in both the port and starboard hulls, with a large pantry located aft in the port hull. The wheelhouse is located on the upper deck and features all-round visibility from the helm seat. Crew and passenger seating is provided around the perimeter of the cabin. Two wing control stations are fitted forward on either side, with a tender/rescue boat located aft within easy reach of the deck crane.

Powered by twin Caterpillar C32 diesels, each producing 969 kW, the vessel will have a service speed of 26 kn at half load. The vessel will have an extended range of 1875 n miles at 22 kn due to two large 12 500 L fuel tanks. This will allow the operators to reposition the vessel far more effectively than they previously could.

Incat Crowther's 24 m catamaran workboat for Offshore Unlimited (Image courtesy Incat Crowther)

The vessel will be built by the Tasmanian shipyard, Richardson Devine Marine, and is expected to be completed by the end of this year. This will be the first catamaran workboat built by RDM which will combine their small workboat experience with the high-tech catamaran passenger ferries for which they have become universally known.

The vessel will be owned and operated by Offshore Unlimited, a Tasmanian company providing vessels to the northern waters of Australia, with operations out of Dampier, WA, and Mackay, Qld. Offshore Unlimited provides a comprehensive offshore service including oil rig supply, survey ship re-supply and chase boat services.

Principal particulars of the new vessel are:

Length OA	24.00 m
Length WL	21.80 m
Beam	8.00 m
Draft (propeller)	1.80 m
Passengers	22
Crew	10
Deadweight	50 t
Fuel	2 × 12 500 L
Fresh water	1 500 L
Main engines	2 × Caterpillar C32 each 969 kW
Propulsion	Propellers
Service speed	26 kn
Construction	Marine-grade aluminium
Survey:	Marine and Safety Tasmania USL Code Class 2A

19 m Catamaran Crew-transfer Ferry from Incat Crowther

Building on the success of their designs which are operating in the wilderness regions of Southland in New Zealand, Incat Crowther have been selected to design a 19 m catamaran ferry for crew-transfer operations in New Zealand's Fiordland National Park. The vessel will be operated by the region's biggest tourist operator, Real Journeys, and will service Meridian Energy's underground hydro-electric power station on Lake Manapouri, transporting staff and light freight.

The vessel is a 19 m high-speed catamaran ferry, capable of carrying 48 passengers at a service speed of 25 kn. The main cabin contains seating for 48 passengers, with further seating for 6 on the vessel's aft deck. The cabin will be fitted out to a high commercial passenger-ferry standard, featuring lightweight seats and panels for all furniture, internal bulkheads and linings. The aft deck will be arranged to carry four small cargo bins while the upper deck will be capable of carrying larger items required by the power station.

Powered by twin EPA-II-capable MTU Series 60 main engines, each producing 447 kW brake power, the vessel will have a service speed of 25 kn at a modest 80% MCR when fully loaded. This will enable the vessel to complete the 16 n mile run in about 35 to 40 mins.

The vessel will be built by Q-West Boat Builders in Wanganui on New Zealand's north island. The vessel, expected to be completed in early 2009, will then be delivered by sea to Doubtful Sound in the Fiordland National Park, where it will be loaded onto a low loader for the 20 km, 200 m vertical climb, up to Lake Manapouri.

Meridian Energy is a state-owned entity which supplies power to around 200 000 residential and business customers. Meridian is the largest supplier of electricity in New Zealand and is the only energy provider with certified carbon-neutral electricity. Meridian operates the largest hydro-electric plant in New Zealand at the western end of Lake Manapouri. The underground facility has been operating since 1972 and has a labor force of about 200 people. Real Journeys operates

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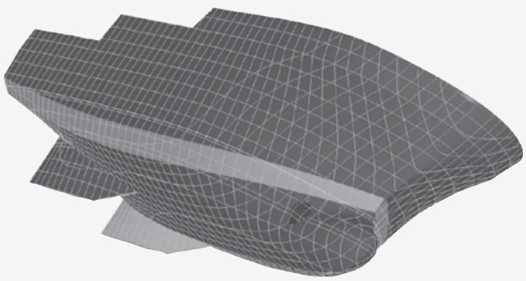
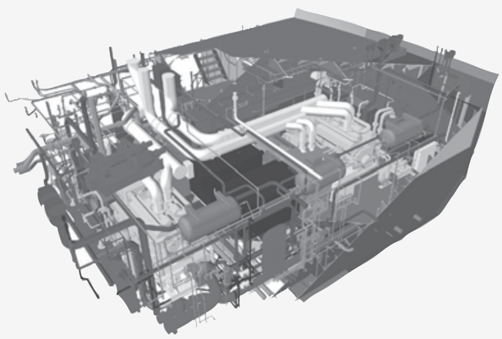


Maxsurf is an integrated suite of design, analysis and construction software suitable for all types of vessels. All modules feature a consistent, graphical Windows interface, work from a common database, and provide data exchange with AutoCAD, ShipConstructor and Microsoft Office.



ShipConstructor offers shipbuilders a complete detailing and production solution for all zones and systems within a ship including structure, equipment layout, piping, and HVAC. The 3D product model is tightly coupled to production output which reduces re-work and most importantly, reduces man-hours in the yard.

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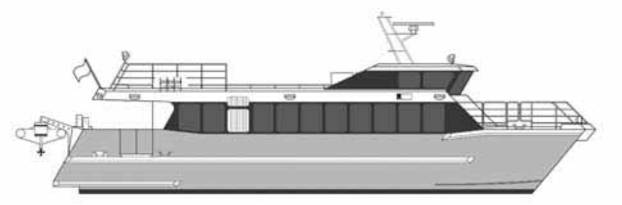
the region's largest tourist group, providing ferry and cruise tours on Doubtful Sound, Lake Manapouri, Lake Te Anau and Lake Wakatipu. They currently operate three other Incat Crowther-designed catamarans.



Incat Crowther's 19 m catamaran crew transfer vessel for Meridian Energy
(Image courtesy Incat Crowther)

Principal particulars of the new vessel are:

Length OA	19.00 m
Length WL	16.65 m
Beam	6.20 m
Draft (hull)	0.80 m
Fuel	3000 L
Fresh water	200 L
Passengers	48
Deadweight	12.14 t
Main engines	2 × MTU Series 60 each 447 kW
Propulsion	Propellers
Service speed	25 kn
Construction	Marine-Grade Aluminium
Survey	NZ Maritime Safety Authority

Ben Hercus

Sodebo under Construction at BoatSpeed

BoatSpeed in Somersby, NSW, is currently building *Sodebo,* a 105 ft (32 m) trimaran for Thomas Coville to a design by Nigel Irens and Benoit Cabaret, with engineering by John Levell. There is an image of the latest flyer on the website, www.boatspeed.com.au, together with a webcam showing photos of the build taken every 60 minutes.

Phil Helmore

Palm Cat from One2three

One2three Naval Architects have designed a 30 m catamaran for Sunferries in Townsville. The new vessel, named *Palm Cat*, is the third One2three vessel for Sunferries. She was built by Aluminium Boats Australia in Brisbane and delivered recently for the service to Palm Island from Townsville

Full details are expected in the next issue of *The ANA.*

Rob Tulk

Palm Cat for Sunferries from One2three
(Image courtesy One2three Naval Architects)

Tenix Sale of Defence Businesses Completed

On 27 June, Tenix completed the sale of its defence businesses to BAE Systems Australia (BAES).

"I am delighted that the sale of the Tenix defence businesses has successfully concluded," said Tenix Group Managing Director and Chief Executive Officer, Greg Hayes. "While the sale process has been a long and demanding one, staff in all Tenix businesses have demonstrated diligence and professionalism throughout.

"Our strategic intent had been to foster international growth for Tenix's defence businesses, so the sale to BAES, with its scale, depth of production and experience, will certainly help to achieve this objective," Mr Hayes said.

"I would like to congratulate Jim McDowell and his team at BAES on this important acquisition. The lengthy and complex completion process was conducted professionally and in good spirit by BAES and Tenix, which bodes well for the merger of the two companies' businesses."

Tenix Chairman, Paul Salteri, thanked everyone who worked so hard in bringing this sale process to completion.

"From a personal perspective, the sale completion brings to an end our family's involvement with the defence industry. It has been a long and exciting association and I want to thank everyone who has been part of Tenix's success over the years. Their efforts helped make these defence operations the outstanding businesses they are," Mr Salteri said.

"I wish Tenix's defence employees all the very best for the future."

BAE Systems and VT Group create Naval Joint Venture in UK

On 11 June, BAE Systems and VT Group signed the final legally-binding agreement to form the Joint Venture company, BVT Surface Fleet (BVT). The agreement, which took effect on 1 July, combines BAE Systems Surface Fleet Solutions, which includes surface warship building and surface warship through-life support, VT's surface warship building and through-life support operations and each of BAE Systems' and VT's 50% shareholdings in their existing surface warship through-life support joint venture, Fleet Support Limited.

BVT will also have a 15 year partnering arrangement with the UK MoD which supports the transformation of the British naval industry sector and provides BVT with leadership of defined future programmes aligned with BVT's commitment to provide consistent delivery of the best equipment, services and support to the Royal Navy.

BVT will operate facilities in Glasgow, Bristol (Filton) and Portsmouth.

RN Carrier Contract Signed

The UK Ministry of Defence recently signed contracts with British industry to build two aircraft carriers — the largest warships ever to be built for the Royal Navy. The contracts, worth in the region of £3 billion, were signed with the newly-formed UK maritime joint venture, BVT Surface Fleet, and the Aircraft Carrier Alliance onboard HMS *Ark Royal*, one of the Royal Navy's existing aircraft carriers and currently the Fleet Flagship.

An impression of the recently-ordered Royal Navy aircraft carriers HMS *Queen Elizabeth* and HMS *Prince of Wales*
(UK MoD image)

Contracts authorised encompass work worth:

£1,325 million for the construction of large sections of both ships by BVT Surface Fleet at Govan on the Clyde and Portsmouth;

£300 million for the construction of large sections of the ships at the BAE Systems yard at Barrow-in-Furness;

£675 million for the bow section, final assembly and completion of the ships by Babcock Marine, with assembly taking place at Rosyth;

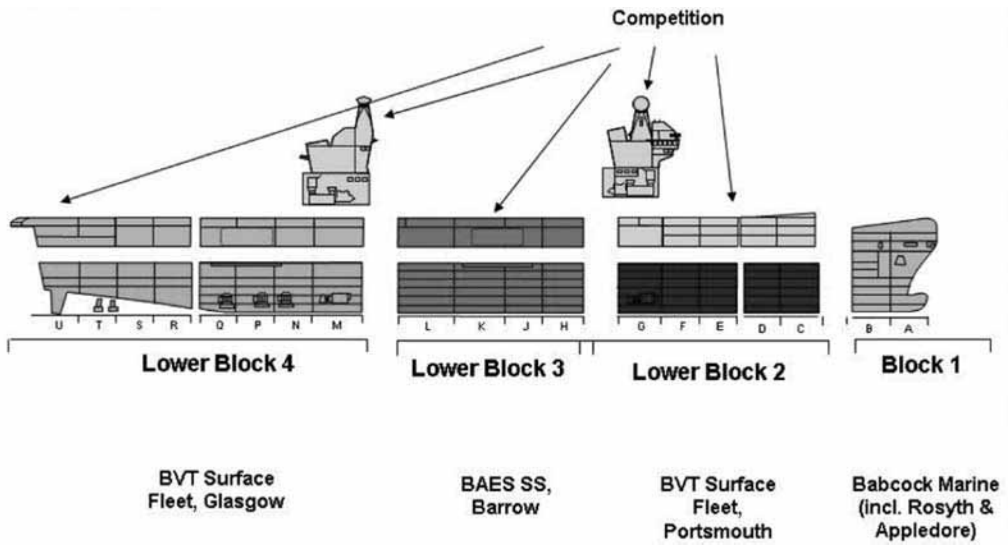
£425 million for design and engineering for Thales UK; and

£275 million for design and supply of mission systems for BAE Systems Integrated Systems Technologies (Insyte).

Construction of the carriers is expected to create around 10 000 UK jobs at the peak of production.

The aircraft carriers, to be named HMS *Queen Elizabeth* and HMS *Prince Of Wales*, will be the biggest and most powerful surface warships ever constructed in the UK. They will provide the Royal Navy with world-class capabilities, supporting peace keeping, conflict prevention and strategic operational priorities.

Once the carriers enter service in 2014 and 2016 respectively, they are expected to remain in the fleet for at least thirty years.



A drawing showing the allocation of work to the various participants in the Royal Navy aiircraft carrier programme
(UK MoD drawing)

US Navy Cancels DDG1000 Destroyer Program

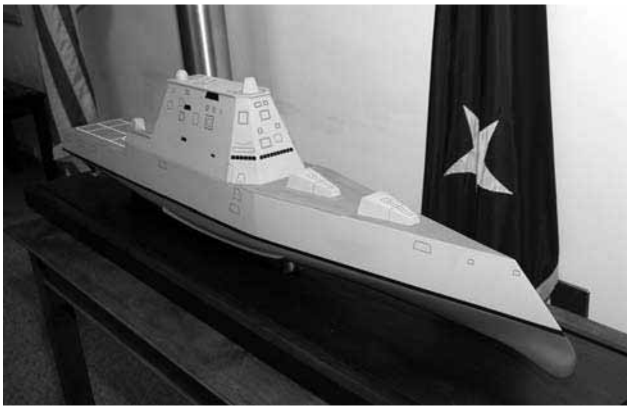
On 25 July, the US Secretary of the Navy informed members of the US Senate and House of Representatives of plans to cancel the $US29 billion DDG1000 program after completion of the first two ships.

Cancellation of the 14 000 t Zumwalt-class destroyer was prompted by a 50% rise in cost to $US3 billion per ship. The program has become too expensive and would make it impossible for the US Navy to meet its overall goal of a 313-ship fleet. The US Navy currently has about 280 ships.

It was reported that the US Navy had concluded that the destroyer's design was not well suited to combating the evolving threat of long-range missiles.

The cancellation follows on from a reduction in the number of prototype littoral combat ships from four to two.

It is also reported that the US Navy is likely to fill the gap in the new-construction program with orders for up to nine improved DDG51 Arleigh Burke-class destroyers.



And then there were only two — a model of the US Navy's new DDG 1000 destroyer. The contract was reported in the last edition of *The ANA*
(US Navy Photo)

First LCS begins Sea Trials

The first ship of the US Navy's new Littoral Combat Ships, the future USS *Freedom* (LCS 1), began trials on Lake Michigan on 28 July 2008.

The LCS is a fast, agile, focused-mission ship designed to defeat asymmetric "anti-access" threats such as mines, quiet diesel submarines and fast surface craft. The 114.5 m *Freedom* is being designed and built by a Lockheed Martin-led industry team.

"Getting *Freedom* underway is a significant step in the ship's steady progress toward entering the fleet," said LCS Program Manager, Captain James Murdoch. "*Freedom* has overcome many challenges to reach this important milestone. LCS 1 will add tremendous capabilities to the fleet for our sailors."

After the contractor's trials, *Freedom* will return to Marinette Marine to prepare for acceptance trials which will be conducted by the US Navy's Board of Inspection and Survey.

The LCS program consists of two different hull forms — a semi-planing monohull and an aluminium trimaran — designed and built by two industry teams, respectively led by Lockheed Martin and General Dynamics. The ships will be outfitted with reconfigurable payloads, called mission packages, which can be changed out quickly. These mission packages focus on three mission areas: mine counter measures, surface warfare and anti-submarine warfare.

Freedom is scheduled to be delivered to the US Navy later

Freedom on trials
(Lockheed Martin photo courtesy US Navy)

A retired US Navy destroyer heads for the bottom of the Pacific after being despatched by HMAS *Waller*
(US Navy Photo)

Warshot first for HMAS *Waller*

The Minister for Defence, the Hon. Joel Fitzgibbon MP, congratulated the crew of the Australian submarine, HMAS *Waller* on 24 July, for being the first submarine to successfully fire a new heavyweight torpedo which has been jointly developed by Australia and the United States.

The firing occurred during the Rim of the Pacific 2008 (RIMPAC 08) exercise, involving multiple navies off the coast of Hawaii between June and July. This controlled exercise resulted in the planned sinking of a retired US warship.

"This represents the first new heavyweight torpedo warshot to be fired by either Navy. Just as significant is the fact that the warshot torpedo was assembled in Australia," Mr Fitzgibbon said.

The MK 48 Mod 7 Common Broadband Advanced Sonar System (CBASS) torpedo is the latest enhancement for the MK 48. Considered the world's premier submarine-launched torpedo, the MK 48 Mod 7 represents a superior capability against both surface ships and submarines with sonar enhancements which make the torpedo an effective weapon in shallow water and in a countermeasure environment.

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The development of the CBASS torpedo has been achieved under an Armaments Cooperative Program between the United States Navy and the Royal Australian Navy. This partnership has established common requirements, interfaces, configurations and maintenance standards, enabling any Australian or US submarine to load torpedoes prepared by any Australian or US torpedo-maintenance facility.

This submarine partnership has also led to co-development of a new replacement combat system, which is being progressively integrated into USN nuclear submarines and RAN diesel-electric submarines.

This successful live-fire exercise underscores the maturity of the joint torpedo and submarine combat-system programs for the RAN and USN.

Help for Navy to Retain Corporate Knowledge

On 10 June, Commodore Steve Gilmore of Navy Systems Command and Professor Lee Astheimer of the University of Wollongong jointly committed to a vital $240 000 project to determine effective ways to retain specialised corporate knowledge when long-standing employees retire.

Signing the contract at the Australian Research Council offices in Canberra, Commodore Gilmore said the outcomes of the knowledge management project undertaken by the University will be directly applied to Navy's maritime engineering community.

"Like many Australian organisations, Navy's maritime engineering community has long-standing personnel approaching retirement age who have specialised corporate knowledge amassed over many years," Commodore Gilmore said. "This project will provide the methodology to ensure effective transfer of this valuable corporate knowledge. It will contribute to maintaining the Nation's security through the sustainment of Navy's military and naval engineering capability."

"Another benefit will be the accelerated knowledge growth and enhanced future career prospects of our newer civilian and military maritime engineering personnel," Commodore Gilmore said.

Professor Astheimer, who is the Acting Deputy Vice-Chancellor (Research) at the University of Wollongong, said that the research had major implications for all Australian organisations.

"Managing specialised corporate knowledge is critical to an organisation's operational effectiveness," Professor Astheimer said. "Knowledge loss represents the most significant business risk in the 21st century. Organisations face the very real threat of substantial knowledge resources walking out the door en masse, due to increasing retirements and employee turnover. This project will maximise retention of irreplaceable knowledge by capturing and sharing valuable corporate knowledge before it can leave the organisation."

Australian Research Council (ARC) Chief Executive Officer, Professor Margaret Sheil, congratulated the Navy for recognising the importance of collaborative research to Australia's ongoing prosperity.

"The outcomes achieved and the relationships developed through ARC Linkage schemes help to strengthen our national innovation system and solve real-world problems," Professor Sheil said. "The results of this project will benefit the Navy, but they will also benefit the wider community because the knowledge gained by the University of Wollongong researchers will have wider applications. In addition, the project will provide expert training to a talented postgraduate research student."

The ARC is providing $180 000 to the project over three years.

Commodore Steve Gilmore and Professor Margaret Sheil at the signing ceremony for the corporate knowledge research project (RAN Photograph)

Tug Order for Strategic Marine

In May, Western Australian shipbuilder Strategic Marine won a contract to build a 23.9 m new-generation compact tug — the first tug order in the company's history.

The 60 t bollard pull tug has been ordered by the Port of Napier — another breakthrough since the port becomes Strategic Marine's first New Zealand client.

The steel tug will have a deadweight of 105 t, a free-running speed of 12 kn and will be powered by a Voith Water Tractor. Strategic Marine, which has built its reputation on high-performance aluminum patrol boats and offshore service vessels, won its first contract to build steel-hulled vessels earlier this year from Singapore's Marfield Limited.

The new-generation tug and the Marfield order for two 143 m steel dive-support vessels will be constructed at Strategic Marine's new 136 500 m^2 Vietnamese shipyard located in Vung Tau, a facility which is fully equipped to build steel boats.

The yard is also currently building the base pontoon for the $62 million Floating Dry Dock on order from the Australian Marine Complex at Henderson in Western Australia, four 20 m landing craft, and forty 12 m offshore service vessels.

Strategic Marine's Vietnam Managing Director, Mark Schiller, said the company was delighted to reach yet another milestone in its business plan. "This latest project will enable us to develop our reputation in the tug market, which is something that our Board of Directors committed to achieving in 2008," Mr Schiller said.

Strategic Marine's order book currently stands at more than $200 million, with most of those orders won in the past 18 months, the majority of them from overseas.

More Duty for *Swift*

Now in her fifth year with the US Navy, HSV 2 *Swift* could remain in military service for another five years, thanks to a new charter for the Tasmanian-built 98 m Incat wave-piercing catamaran.

Sealift Inc. of New York has been awarded the charter of *Swift* for up to 59 months, starting on 1 October 2008, by the US Navy's Military Sealift Command. The company, which will charter the craft from its US owner, Bollinger/Incat, has been awarded a $US21 913 900 firm-fixed-price contract for a 12-month charter of the US-flagged, contractor-operated, high-speed vessel.

The contract for *Swift* contains four options, which include three 12-month options and one 11-month option which, if exercised, would bring the total contract value to $US93 076 577. Sealift Inc. is a privately-held company, incorporated in New York. The company operates a fleet of twelve US flag, ocean-going ships, operating on liner services to worldwide destinations. They are also one of the largest ocean-transportation contractors for US Government Food Aid cargoes.

Under Sealift, S*wift* will be operated worldwide in support of US Fleet Forces Command. The vessel will also be used to test emerging operational concepts.

The contract was competitively procured by Military Sealift Command with more than 80 proposals offering various high-speed craft solutions solicited.

Swift, and the Incat vessels HSV-X1 *Joint Venture* and TSV-1X *Spearhead* before her, has already been employed by the Department of Defense for experimentation and demonstration of high-speed vessel technologies as well as for logistics support.

Swift also supported relief operations in Indonesia and in the Gulf Coast region following hurricane Katrina. In both cases, *Swift*'s high speed and shallow draught combined to make her an ideal platform for the delivery of relief supplies and support of other vessels operating in the area. During operations following Katrina, *Swift* was able to access ports inaccessible to other ships in the logistics force, and therefore played a critical role in the early delivery of supplies.

"This is good news for Bollinger/Incat as, if all the options of the contract are exercised, *Swift* will be operational with the US Navy until after the JHSV comes online," said Andrew Cooke, JHSV Project Manager at Incat.

The JHSV (Joint High Speed Vessel) is a new-generation, multi-use vessel capable of transporting troops and their equipment, supporting humanitarian relief efforts, having the ability to operate in shallow waters, and reach speed in excess of 35 kn fully loaded. The project brings together United States Navy, Army, Marines, and Special Operations Command to pursue a multi-use vessel.

A consortium of high-speed craft industry experts headed by Bollinger Shipyards was recently awarded one of three multi-million dollar design contracts by the US Department of Defense.

"Both Incat and Revolution Design are part of the international consortium responding to the US Department of Defense acquisition program for the JHSV. That consortium is led by Incat's United States partner, Louisiana-based Bollinger Shipyards, Inc.," Andrew Cooke explained.

The Incat 112 m vessel, which forms the base of the consortium's submission, is the largest catamaran ever built in Australia. Already proven in commercial service it provides unparalleled seakeeping and comfort even on rough open-sea routes.

"We believe the vessel is ideally suited to the demanding criteria laid out by the JHSV program, many of which are already met by *Swift*. Given the operational experience of *Swift*, and the excellent results of the two 112 m vessels already in commercial service, we are confident that a 112 m vessel can provide the optimum formula for the US military's needs,' Mr Cooke concluded.

Award for Incat's 112 m Catamaran

Natchan Rera, the first of Incat's impressive 112 m wave-piercing catamarans, has been recognised at Europe's annual ferry industry event, the ShipPax Ferry Shipping Onboard Conference, attended by some 300 ferry shipping executives.

Japan's Higashi Nihon Ferry won the coveted ShipPax Hispeed Concept Award, recognising the implementation of an integrated ferry system with state-of-the-art port terminals as well as the largest diesel-powered high-speed ferry with separate truck and car decks. The ship's "innovative and high-grade accommodation, with a walk-around internal promenade and the first escalator installation in a lightweight fast ferry," also received special mention.

The ShipPax Award was launched as a means to stimulate innovative solutions, promoting noteworthy design features across various categories on newly-delivered ferries, ro-ro and cruise vessels, and is considered the most prestigious trade award in this sector of the industry.

A diploma is presented to the winner in each category, and sent to respective ship owners and builders. The diploma is accompanied by a glass sculpture, handed over to the ship owner to be displayed on board the award-winning vessel.

Natchan Rera operates across Japan's Tsugaru Strait between the islands of Honshu and Hokkaido, approximately halving the time currently taken for voyages between Aomori and Hakodate by conventional ferries, and greatly enhancing the convenience of regular passenger services. On 2 May she was joined in service by a second Incat 112 m ferry, *Natchan World,* and both offer a crossing time of one hour and 45 minutes on the 61 n mile passage.

Natchan Rera and *Natchan World* sail at loaded speeds of approximately 40 kn, with capacity to carry 355 cars or 450 lane metres of trucks and 193 cars. While Incat's 112 m design can accommodate up to 1200 persons, both Japanese vessels' luxurious accommodation has been custom designed and laid out to cater for 800 persons in unprecedented levels of style and comfort.

With the delivery of *Natchan World*, Higashi Nihon Ferry is fulfilling the second part of its plan to expand the prospect of its ferry business by changing from the existing cargo-centred strategy to the creation of a hospitality business with a high added value targeted at the customer.

UNSTEADY EFFECTS ON WAVE GENERATION OF SHIPS

Lawrence J. Doctors
The University of New South Wales

Summary

An extensive set of towing-tank experiments on the wave generation of catamaran ship models was conducted in order to test the predictive ability of unsteady linearised wave theory. It is demonstrated that it is essentially impossible to achieve the steady-state wave pattern in a typical towing tank in the region of the depth-critical speed. However, the theory can be used with confidence to predict the incompletely-developed wave system behind the model.

1 Early Work on Wave-wake Generation

The matter of wave generation of vessels is of great importance when considering their operation on rivers, because of the concern of damage to the shores by the wave system generated by these ferries. Australia has been in the forefront in this field, both in terms of the design and the construction of high-speed river ferries and in the research into their hydrodynamic behaviour.

This research has now spanned almost exactly two decades. An early example was the work of Renilson and Lenz (1989). This was followed by the research of Doctors, Renilson, Parker and Hornsby (1991). A total of ten candidate vessels, both catamarans and trimarans, was studied for operation on the Parramatta River. The model tests showed that increasing the spacing between the two demihulls of a catamaran would reduce the height of the generated waves. This outcome correlated well with theoretical predictions of the wave resistance, using the traditional thin-ship theory based on Michell (1898) and modified for the case of a laterally-restricted waterway by Sretensky (1936). This effort led to the development of the very successful RiverCat catamaran, seven of which were eventually constructed.

Traditionally, wave-generation theory has been based on a purely inviscid approach in which the potential-flow approach, pioneered by the Australian Michell (1898), was used. This point was investigated exhaustively by Doctors (2003), who did an experimental investigation on a model catamaran, in which longitudinal wave profiles were measured and compared with the predictions of the inviscid theory. Generally, excellent correlation between the experiments and the predictions for the wave profiles was achieved. Similarly, comparisons of the root-mean-square wave elevation were equally promising. The influence of viscosity was also included, in an approximate manner, following the unique approach of Tuck, Scullen, and Lazauskas (2000).

This work was later extended by Doctors and Zilman (2004), who also incorporated the effect of surface tension and elasticity of surfactants at the free surface. It was shown that the presence of these additional physical properties, while relatively small, had a measurable effect on small ship models towed at the lower end of the Froude-number range.

2 Unsteady Effects

The tests included in these earlier studies were performed in the Model Test Basin at the Australian Maritime College (AMC). It was noticed that the correlation between the experiments and the theory was, in some cases, somewhat poorer than that obtained, for example, in the much longer Towing Tank at the AMC. The general observation appeared to be that the experimental data for the wave elevation was too low. This raised the suspicion that the length of run of the ship model, before the start of the sampling of wave data, might be a critical factor.

It is these suspicions that led to the investigation of the true time-domain development of the wave system of the ship model under test in a hydrodynamic facility. This is the subject of the current paper.

3 Other Studies

All of the above theoretical work was based on the principle of a so-called linearised approach, which greatly reduces the computational effort and time in comparison with fully non-linear methods, such as that of Raven (2000). While such nonlinear calculations are likely to eventually lead to more accurate predictions in the future, they currently do not. This negative outcome is likely due to the difficulty in coding the associated computer software to converge accurately. Due to the computational burden, one is also limited to a rather small area in the neighbourhood of the vessel; consequently, predictions of the wave field far downstream, or far to either side of the vessel, are not feasible. Additionally, there are no published numerical results for wave-wake predictions which are both nonlinear and unsteady.

Another practical approach to the analysis of wave generation is to test a large number of vessels in a towing tank or an ocean basin and to perform a statistical analysis of the resulting wave systems. Two successful examples of such work were those by Macfarlane and Renilson (1999 and 2000).

Finally, the results of several studies on the environmental aspects of fast ferries have been made available. These include the full-scale investigations of Kofoed-Hansen and Mikkelsen (1997). Similarly, an example of optimisation of hull shapes was published by Leer-Andersen and Larsson (1999).

4 Experiments in the Towing Tank

The present research is a reanalysis of the experiments described by Doctors (2007); the reader is referred to that paper for a fuller description of the three ship models which were tested in the AMC Towing Tank. These models are modified versions of the Series 64 hull defined by Yeh (1965). The models differed only in terms of their beam. Apart from this, they were geometrically similar. A wireframe representation of the intermediate model is depicted in Figure 1(a).

Figure 1(b) shows how the monohull models were tested, by towing them at various offsets from the side of the tank. According to the reflection principle, the experiments simulated an equivalent set of tests on a catamaran, whose demihull separation is double this offset. The equivalent towing tank has twice the actual width. These statements are true, assuming that one can ignore the very weak wave-induced boundary layer on the reflection wall of the towing tank.

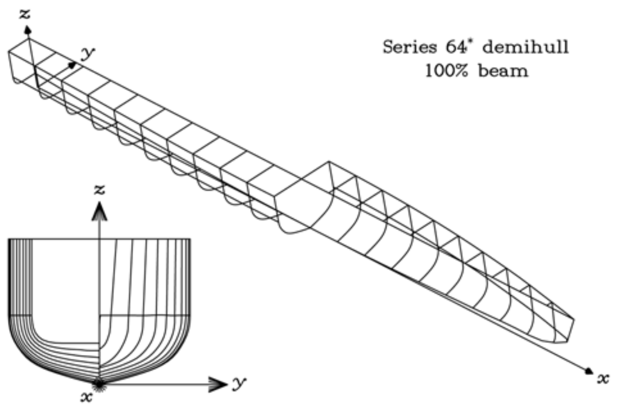

Figure 1 — Definition of the problem
(a) Demihull with 100% beam

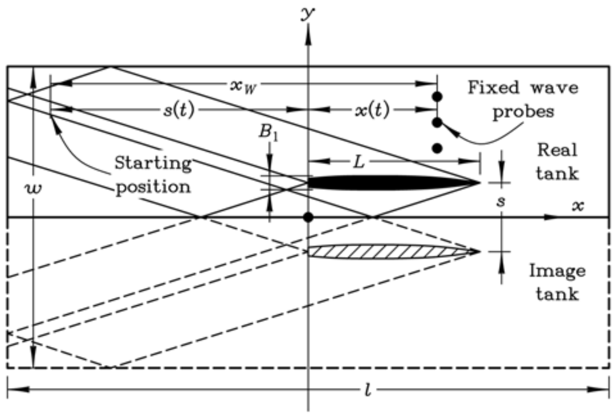

Figure 1 — Definition of the problem
(b) Experimental setup

A photograph of the towing arrangement of the demihull appears as Figure 2(a). It can be seen that the towing arrangement was made complicated by the desire to conduct tests in relatively shallow water. An example of the ship model under way is shown in Figure 2(b). As noted earlier, one can view the wave field as being one half (the port half) of the total field of the equivalent complete catamaran.

5 Influence of Viscosity and Unsteady Effects

We consider now Figure 3(a) which is a plot of the root-mean-square wave elevation. This quantity is computed transversely over all five wave probes and longitudinally over a distance of seven model-lengths aft of the transom. This is a good measure, or metric, of the magnitude of the wave system generated by the ship. Other metrics are, of course, available. However, it is by no means clear which metric of the wave system should be utilized, if one is concerned about the ability of the wave wake to destroy river banks, for example. The wave elevation has been rendered dimensionless against the model length. It is plotted against the Froude number.

There are three sets of data. The first set of data is indicated by the circular symbols and is indicated as "Exp"; it represents the outcome of analysing the experimental data from the fixed wave probes, shown in Figure 1(b). These were located at a station 60 m ahead of the starting position of the model, corresponding to 40 model lengths. The water depth in this example was 0.750 m, corresponding to a water-depth-to-model-length ratio of 0.5. The acceleration of the model carriage was 0.066 of the acceleration due to gravity. This is noted on the plot.

The second, dashed, curve indicated by "Real" is a calculation based on the steady-state theory as exemplified by Doctors (2003), and includes the influence of real-fluid properties, including the viscosity. This prediction provides an excellent estimate of the magnitude of the wave system, over the entire range of the Froude number, except in the vicinity of the critical speed. The critical speed occurs when the depth Froude number equals unity. This occurs, in the current example, when the (length) Froude number is 0.7071. In fact, as already noted in previous publications, the theory suggests infinite wave elevation at the critical speed. This prediction is, of course, unacceptable for practical applications.

The third curve is an alternative steady-state prediction, which includes the local wave system. It is seen that this prediction misbehaves in a similar manner to that of the "Real" curve (which did not include the local wave system), in the neighbourhood of the critical speed. It is encouraging to note that the supercritical prediction is definitely superior. Indeed the correlation between theory and experiment in the supercritical region is now essentially perfect.

We now turn to Figure 3(b). This plot has five sets of data and includes unsteady calculations. Once again, the symbols are employed to indicate the same experimental data as that in Figure 3(a). The second, third, and fourth curves,

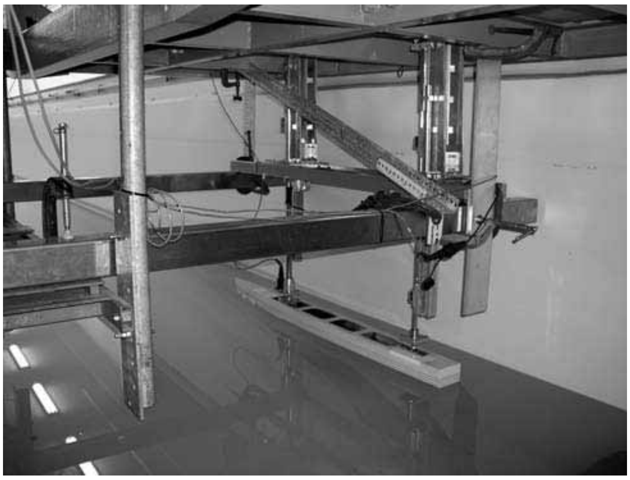

Figure 2 — Experiments in towing tank
(a) Carriage and model

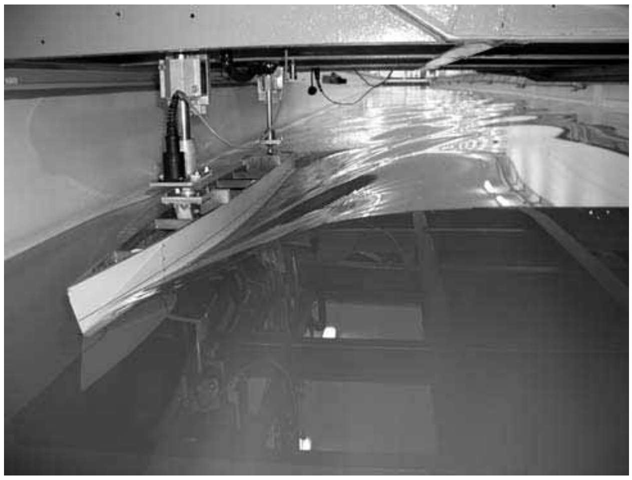

Figure 2 — Experiments in towing tank
(b) Demihull under tow

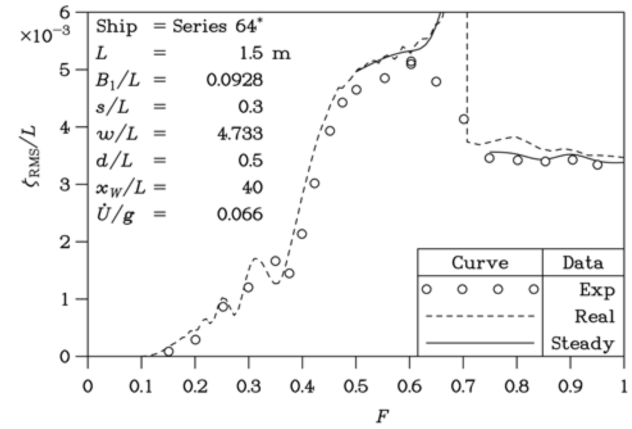

Figure 3 — Test of different theories
(a) Influence of viscosity

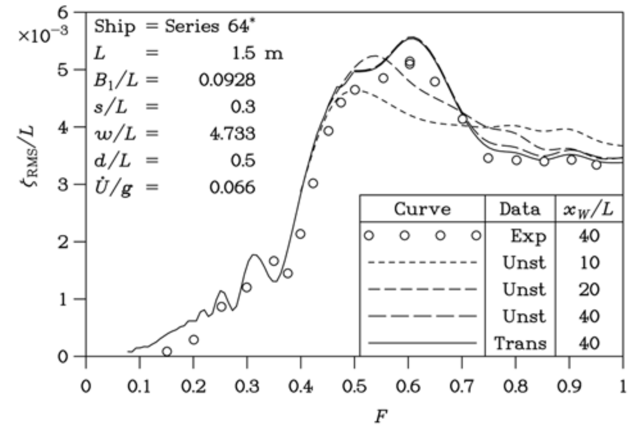

Figure 3 — Test of different theories
(b) Influence of unsteady effects

indicated by "Unst" and annotated with three different values of the dimensionless location of the wave probes, are the unsteady calculations. The three dimensionless values correspond to wave-probe locations of 15 m, 30 m and 60 m, respectively. It is clearly seen that, as the location of the wave probes is progressively shifted to the proper value of 60 m, the magnitude of the theoretical wave system in the trans-critical region is increased, to the point where it agrees very well with the experimental data. The unrealistic spike in the prediction, evident in Figure 3(a) for the steady-state calculation, has now been eliminated.

Finally, a fifth curve, indicated as "Trans", is a further calculation, in which only the transverse wave component is treated in an unsteady manner. The remaining components of the wave system are computed as if a steady state had been achieved. It is seen that the outcome of this simpler approach is essentially identical to that of the more involved full-time-domain calculations. We have therefore proven that the major deficiency of steady-state calculations can be linked to the characteristics of the transverse wave component. The physical explanation for this phenomenon is that the length of this wave becomes large (ideally, infinite) at the critical speed. It takes an infinite amount of time in order for it to be fully developed in a physical experiment, such as a towing tank.

6 Wave-elevation Curves

As an additional clarification of the transverse-wave phenomenon, we present here Figure 4. This figure is a plot of the longitudinal wave cuts at a depth Froude number of 0.99, that is, very slightly subcritical. The two parts of the figure relate to two different lateral offsets of the wave cut. These offsets are one model length and two model lengths, respectively.

The wave elevation is made dimensionless with respect to the model length, as before. It is plotted against the longitudinal coordinate, measured forward from the model transom. It is also made dimensionless against the model length. The plot shows the wave profile for seven model lengths aft of the transom.

The first curve, indicated as "Exp" is the experimental data. Two sets of unsteady theoretical calculations are shown. They are indicated as "Unst" and they correspond to two values of the position of the wave probe. When one chooses the correct dimensionless wave-probe position of 40 m, corresponding to its proper location in the towing tank, excellent correlation with the experiments is achieved. This is particularly so for the greater offset of the wave probe in Figure 4(b).

The steady-state predictions are also plotted in the two parts of Figure 4. These predictions exhibit the correct waviness possessed by the unsteady predictions and the experiments. However, the steady-state predictions also include a large-wavelength oscillation, already alluded to in the previous section. Thus, we have further proof of the underlying cause of the failure of steady-state predictions in this subcritical speed range.

For these reasons, we must emphasize here that the physical experiment in the towing tank will suffer, in that it cannot be used for extrapolation to the situation of the full-scale prototype vessel, assuming that one is interested in steady-state wave generation in the transcritical speed range.

7 Conclusions

The extensive experiments and unsteady-wave calculations have confirmed that:

(1) Linear wave theory can be applied to the case of practical marine vessels, even those with a relatively high beam-to-length ratio.

(2) The theory can be used for an extensive range of geometries and water depths.

(3) It is necessary to employ the full unsteady time-domain theory if one wishes to predict the characteristics of the generated wave system in the region of the critical speed, where the depth Froude number is unity. This is particularly true at subcritical speeds, rather than supercritical speeds.

(4) Essentially all the unsteady effects can be traced to the slow development of the transverse wave component in the wave spectrum generated by the ship. This is because the remaining wave components possess a much shorter wave length. These remaining wave components are developed relatively quickly. The conclusion from this is that one need only apply the unsteady theory to the transverse wave component. This simplification can result in a considerable saving in computational effort - with negligible loss in accuracy.

(5) We reiterate here that real-fluid effects, principally that of viscosity, can play a measurable role for the small models tested at the AMC. However, this role is only important at very low Froude numbers.

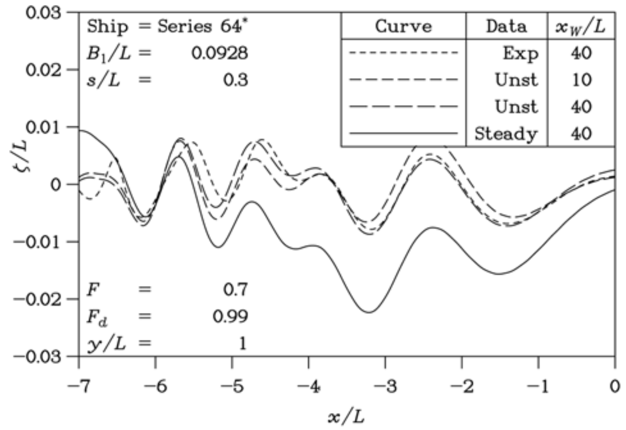

Figure 4 — Growth of wave profiles
(a) F = 0.7, F_d = 0.9899 and y/L = 1.0

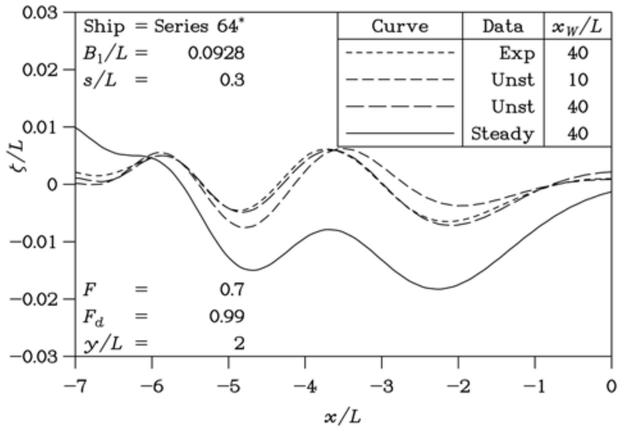

Figure 4 — Growth of wave profiles
(a) F = 0.7, F_d = 0.9899 and y/L = 2.0

8 Acknowledgments

The tests were performed in the Towing Tank at the Australian Maritime College (AMC) under the supervision of Mr Gregor Macfarlane, Mr Richard Young and Mr Liam Honeychurch. The author would particularly like to thank Mr Young for his additional investigation, some time after the series of tests, in which he was able to accurately quantify the level of acceleration of the towing carriage. This was a vital piece of data needed for the theoretical analysis.

The author acknowledges the assistance of the Australian Research Council (ARC) Discovery-Projects Grant Scheme (via Grant Number DP0209656). Infrastructure support was provided by The University of New South Wales.

The full details of the steady and unsteady theories referred to in this paper were published by Doctors (2008).

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THE ULTIMATE SAILING CRAFT — A WING-BORNE HYDROFOIL

Martin Grimm

There is renewed interest in breaking the outright speed-sailing record, which is currently held by Antoine Albeau who set the new record of 49.09 kn on a sailboard at Les Saintes Maries de la Mer, France, in March 2008.

At least three speed-sailing projects are at various stages of development or trials in Australia. One such project is the Wing-borne Hydrofoil (WBHF) conceived and developed theoretically by Mr Stephen Bourn, a mathematician and scientist with the Defence Science and Technology Organisation in Adelaide, Australia.

Although radio-controlled model testing of the concept had already been undertaken previously, work commenced in 2007 on the detailed design and manufacture of a full scale prototype of a WBHF to Stephen's design as a mechanical engineering undergraduate student project at the University of Adelaide. This work will continue in 2008. Supervisors for the project are A/Prof. Ben Cazzolato, Stephen Bourn and Dr Carl Howard.

After proving the concept, the intention is to attempt to break the world sailing speed record and, ultimately, achieve the goal of 54 kn (100 km/h). Thereafter, commercial production may be undertaken to satisfy demand for such high-performance sail craft for either the sailing equivalent of Formula 1 racing or as a form of recreational 'extreme sport'.

DESIGN

The design was inspired after a fresh look at the basic principles of sailing and examination of the absolute limits to high performance sailing.

This craft is intended to fly more like a plane than sail like a boat. The hull is supported and propelled by a wing sail inclined and offset to one side as shown in Figures 1 and 2. The wing pulls the hull up to fly smoothly just above the waves while a hydrofoil assembly provides lateral resistance to counteract the sail force as well as generating additional lift. The craft has been designed to sail at more than twice the wind speed. It is expected that in light to moderate winds, with the hull still in the water, the WBHF will be just as fast but easier and safer to sail than the quickest existing boats, because of its inherent stability and self-righting properties.

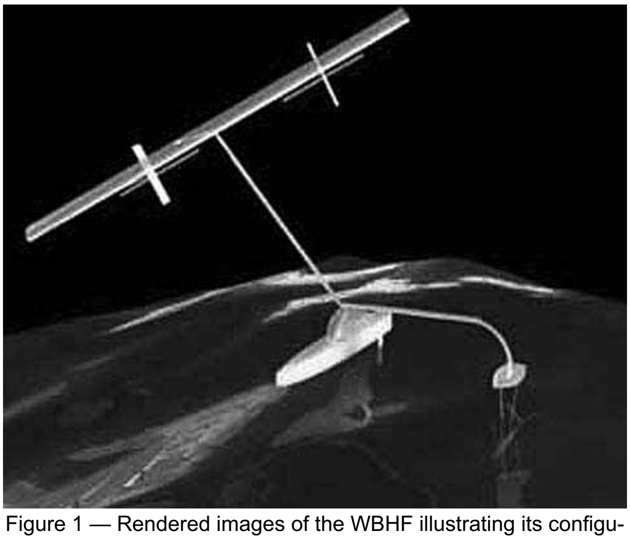

Figure 1 — Rendered images of the WBHF illustrating its configuration when sailing
(Image courtesy Stephen Bourn)

Figure 2 — Rendering of WBHF showing the components of the craft
(Image courtesy University of Adelaide)

Unlike many dedicated speed sailing craft, the WBHF has the ability to tack and sail in all directions, in a range of wind conditions and in exposed waters. The wing is able to adjust to the optimal angle relative to the wind via servo tabs. Although the craft incorporates design features to self-correct and stabilise should it be disturbed, there will be provision for the quick release of the wing in case of an emergency situation.

The hull, designed to support either one or two people, is lifted out of the water when the craft achieves sufficient speed in 10-15 knots of wind, thus eliminating a significant source of drag, and accelerating the craft to considerably high speeds.

The craft is intended to employ several control systems to ensure stability once flight is achieved and provide pilot control. Given these unique characteristics, it is believed that the WBHF has the potential to challenge several sailing records including the bi-directional nautical mile sailing speed record and, ultimately, the world sailing speed record.

The craft can be carried on a trailer, and should be able to be rigged quickly and be launched from a beach. The wing will be collapsible.

Main dimensions and weight for the craft are:

Hull length	3.6 m
Wing span	8.0 m
Wing area	16 m^2
Hydrofoil span	0.9 m
Width	5.5 m
Weight	75 kg
Ballast	30 kg

CONSTRUCTION

The craft is being constructed with extensive use of carbon-

Figure 3 — Adelaide University mechanical engineering students display the composite hull behind a scale model of the craft (Photo courtesy University of Adelaide)

Figure 4 — The students display the progress made on the hydrofoil assembly for the craft (Photo courtesy University of Adelaide)

fibre composite sandwich materials using vacuum resin-infusion techniques to ensure high strength and minimum weight.

Over the 2007–2008 summer, work was underway on various components of the craft. After initial difficulties achieving satisfactory resin infusion of the curved tubes for the cage connecting the hull to the main beam, a good technique was developed and all four cage tubes are now ready for fitting to the hull. One hydro-stabiliser foil has been successfully moulded, with the second one currently in progress. The remaining work on the hull, main beam, bearings and outrigger float has yet to be undertaken. The hull and foil assembly are seen in Figures 3 and 4.

The goals of the 2008 student project will be to complete the design and construction, launch the craft and test and tune the control systems. Specific tasks in 2008 will include:

- design and construction of the twin joystick control inputs and power supply;
- program, test and tune the hydrofoil control (including towing trials);
- review and complete the aerofoil design and construction;
- program, test and tune the aerofoil control (including captive carriage trials);
- test and tune the complete craft (starting with towed trials and finally independent operation);
- design and build a canopy for the cockpit and fairings for the main beam interconnecting the float, hull and wing assembly;
- design and build hydrofoils capable of operating at 50 knots free of cavitation; and
- review the aerofoil design and if necessary develop design modifications for operation at 50 knots.

Further details of this interesting project including a detailed report are available at the University of Adelaide School of Mechanical Engineering's WBHF website: http://www.mecheng.adelaide.edu.au/robotics/robotics_projects.php?wpage_id=44&title=43&browsebytitle=1 with further details at: https://www.mecheng.adelaide.edu.au/4thyearprojects/generalaccess/project_details.php?prj_id=656&year=2008 or the wing-borne hydrofoil website: www.wingbornehydrofoil.com which contains a technical paper containing the sailing performance analysis for the craft. The designer, Stephen Bourn, can be contacted via e-mail: sbourn@wingbornehydrofoil.com.

Figure 5 — Assembly view of the hydrofoil bulb with transparent mid-section and nose cone (Image courtesy University of Adelaide)

THE AUSTRALIAN NAVAL ARCHITECT

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Material can be sent by email or hard copy. Contributions sent by email can be in any common word processor format, but please use a minimum of formatting — it all has to be removed or simplified before layout.

Photographs and figures should be sent as separate files (not embedded) with a minimum resolution of 150 dpi. A resolution of 200–300 dpi is preferred.

Hydrofoils Applied to Canting-keel Yachts

Richard S. Milne
Thales Australia (Naval) Pty Ltd, Australia
Phillip J. Helmore
University of New South Wales, Australia

Hydrofoils have been applied to many different types of marine craft, including yachts. However, most of these have been for attempts at speed records or by inventors and, notably, the international Moth class, but so far not to modern racing yachts. They provide a number of advantages, and this project has investigated the feasibility of application to a modern canting-keel maxi yacht.

The investigation began with drawing up a set of lines for a modern canting-keel maxi yacht. A resistance was then predicted, both with and without foils, using the Delft Systematic Yacht Series and a three-dimensional analysis of the foil-borne resistance. A towing rig was designed and constructed, and several models built and tested on open water and in a swimming pool to compare the resistance and performance, both with and without foils. Finally, a radio-controlled sailing model was constructed and tested, both with and without foils.

The results showed a clear speed advantage for the foil-assisted maxi yacht. Just as with canting keels, fitting foils to an ocean-racing maxi will not be without its problems. However, the evidence is compelling, and it is considered only a matter of time before someone sets a precedent with a full-scale yacht, which others will follow.

1. INTRODUCTION

The use of hydrofoils on sail-powered vessels is not new. Hydrofoils are used in the quest for speed, and the hydrofoil helps vessels achieve this with its high lift/drag ratio. The first sailing vessel to use a hydrofoil was *Monitor*, built in 1955 (International Hydrofoil Society 2006) and shown in Figure 1.

Since then, hydrofoils have been applied to many different types of craft, including monohulls, proas, catamarans and trimarans.

Due to the complexity and fragility of previous foil systems, their use has been confined mainly to the realms of sailing speed record attempts and inventors. However, with the use of composites and high-tensile fibres, modern foils are much more robust and simpler in design.

In recent years the introduction of canting keels to racing yachts has brought a marked increase in speed. The concept, like many innovations, attracted criticism and resistance from the establishment but has been embraced by those with more liberal views in the pursuit of speed.

The authors consider that hydrofoils are waiting in the wings for their turn to push monohull sailing speed limits higher. They therefore embarked on a testing program to investigate the feasibility of fitting foils to a modern canting-keel yacht.

2. SAILING HYDROFOILS

2.1 Previous Hydrofoils

Some of the notable sailing hydrofoils have included the following:

- *Monitor*

  Built at the then huge cost of $20 000, *Monitor* was essentially a monohull with a set of ladder-type main foils on outriggers to port and starboard and a small ladder foil aft which acted as a rudder. She reached 25 knots when launched, and 30 knots a year later (IHS 2006).

- *Williwaw*

  This vessel was built in 1968 and made many ocean voyages (Keiper 1996). She was essentially a sloop-rigged 10 m trimaran, with ladder foils on the side hulls and stern, and a large V-foil at the bow of the main hull.

Figure 1 — *Monitor* sailing on Lake Mendota, USA (Photo Edwin Stein)

  The foil take-off speed was 10–12 kn, and she regularly sailed at 15–22 kn.

- *The Ugly Duckling*

  This vessel was built as a proa in 1982 for a serious attempt on the world sailing speed record, then 34 kn (Smit 1982). The vesel was built for a low budget, using a Tornado catamaran rig and plywood hulls. She achieved 24 kn when fully foilborne, but never broke the world record. However, she showed what could be achieved, and subsequent proas have held the world sailing speed record over the years.

- International Moth Class

  The Moth is an international class of dinghy and is a development class with liberal views on design. In the quest for speed, the class has adopted the use of hydrofoils, as shown in Figure 2. The results are dramatic, with speed increases of between thirty and one hundred percent having been achieved over their non-foilborne predecessors (International Moth Class Association 2006).

Figure 2 — Hydrofoil Moth
(Veal 2006)

- *L'Hydroptere*
  This French-designed trimaran (the name is Greek for water-wing) has convincingly demonstrated just what a hydrofoil vessel can do. She has broken many speed records, including an open-water speed record of 47.2 kn and crossed the English Channel in less time than the first aircraft to do so! (*L'Hydroptere* 2006)

Figure 3 — *L'Hydroptere* at speed
(www.hydroptere.com)

There have been many others, but the sample of vessels described has shown that increases in speed are achievable with the application of hydrofoils.

In recent years the introduction of the canting keel into the world of racing yachts has brought with it a marked increase in speed for those vessels. A modern maxi-yacht with a canting keel regularly travels at speeds of 15–25 kn (International Sailing Federation 2006). It is in this speed range that a hydrofoil should be beneficial in reducing the total resistance of the yacht. Through the inherent efficiency of a foil, a speed increase can be achieved due to a higher lift/drag ratio in comparison with that of a planing hull.

The authors embarked on a project to investigate the feasibility of fitting hydorfoils to a modern maxi-yacht with a canting keel. The key to a successful foil-borne vessel is the power/weight ratio, which is directly related to the righting moment/weight ratio when using a conventional sail configuration. The righting moment, in turn, is directly related to the span of the foils.

The arrangement for the current concept of a foil-assisted monohull was commenced with research of the foil configurations of previous foil-assisted sailing vessels. *L'Hydroptere* gave much inspiration, with her use of angled outer foils and a T-type foil on the rudder. The angled outer foil gives lateral resistance and provides passive ride-height control due to the affects of dihedral. A T-foil attached to the rudder is an efficient way of stabilising the pitch of the craft.

3. DESIGN

3.1 Modelling

The basis for the design project was chosen to be the 30 m maxi-yachts *Alfa Romeo* and *Wild Oats*, designed by Reichel-Pugh. The basic dimensions of these vessels are available on the web (Reichel-Pugh 2006) but, understandably, no lines plan was available from the designer. However, a hull shape was drawn up, using the Rhino CAD package, having the correct dimensions, displacement and general hull shape. We are confident that this shape, while not being an exact replica, is sufficiently close to be able to test the concept, and to show what happens when the vessel becomes foilborne.

3.2 Scaling

For the manufacture of a model of the 30 m maxi-yacht, a scale ratio of 1:25 was selected, giving a model length of 1.2 m.

Making a model to the correct scale displacement proved the most challenging task of all. The racing displacement of the 30 m maxi-yacht is 26 000 kg, which translates to $26\,000/25^3 = 1.664$ kg at 1:25 scale. The challenge lay in keeping the model this light, yet strong enough to handle the sailing forces.

Initial estimates of masses which would be required were as follows:

Item	**Mass (kg)**
Keel	0.915
Fin and rudder	0.130
Sails and rig	0.110
Deck and support structure	0.110
Radio-control unit	0.140
Hull	0.259
Total	**1.664**

With a 1.2 m hull, a mass of only 259 g is a very hard task. Strength scales as the square of size, while mass scales as the cube (the square-cube law), so the material for our 1:25 scale model should be relatively twenty five times stronger than that of the maxi-yacht! If it were not for the non-scaling of materials, then the model would be almost impossible to make.

3.3 Resistance Prediction

Having determined the size of the model, preliminary estimates of the resistance were made using the Delft Systematic Yacht Series for the hull and Design Foil for the foil. The Delft Series II resistance prediction is available in Gerritsma et al. (1991) and was programmed. Although not catering for modern vessels travelling at over 20 kn, the Delft Series predicted resistance up to the speed at which the foil system would take over.

At more than 20 kn the yacht would become foilborne, and the Design Foil program (Dreese 2006) was used to calculate the resistance of the foils. Design Foil is a two dimensional CFD program that is simple to use and proved a useful tool in selecting the foil geometry. A NACA4412 foil was chosen for its characteristics at different angles of attack (other than at optimum). Results of the resistance calculations are shown in Figure 4.

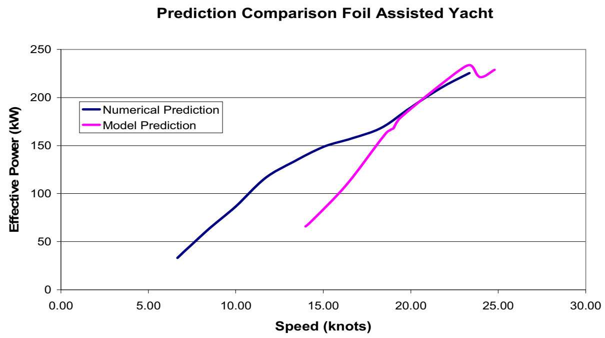

Figure 4 — Resistance calculations from Delft Series and Design Foil

It is not possible to include all of the forces which will act on a hydrofoil-assisted yacht. However, the results of this resistance prediction have been useful in the design of this concept. The resistance predictions have added weight to the viability of this concept.

3.4 Arrangement

The arrangement used for the design of this concept is shown in Figure 5. It is envisaged that implementation of this concept would incorporate active main foils to give a constant ride height, much in the same way as the foil of a modern Moth dinghy works. This results in a foil depth which greatly diminishes the free-surface effect, thus reducing wavemaking resistance. An active foil will also deliver good seakeeping characteristics (a smooth ride), by eliminating wave impact loads.

The incorporation of retractable foils would solve the problem of foil resistance at speeds below foilborne, and solve most berthing problems.

4. CONSTRUCTION OF MODELS

The building of the prototype male plug and female mould gave a good insight into the effort required to create a full-size mould for production. Building of a male plug is a task which requires the utmost precision and quality of finish. Any imperfection, mark, or blemish in the male plug will be carried over to the mould and, most likely, to every production hull to come from that mould. Spending the time to get it right from the start saved a large amount of time later.

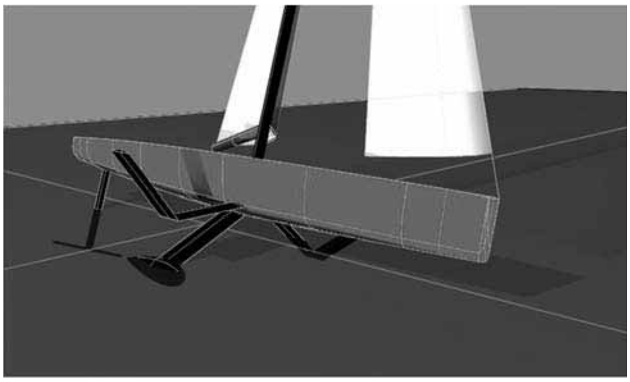

Figure 5 — Concept of the hydrofoil-assisted maxi-yacht

Much of the time was spent checking dimensional precision and fairness of the surface. Any variation required filling and sanding until a level of perfection was reached.

The prototype was built using a foam sandwich structure. Strips of Divinycell foam were attached to a plywood mould with double-sided tape and covered with a layer of fibreglass and resin as shown in Figure 6. The prototype was lifted off the mould and glassed on the inside.

Many weeks were then spent filling and sanding the outside until perfect finish and shape was acquired, as shown in Figure 7.

Figure 6 — Plug under construction, still attached to building frame

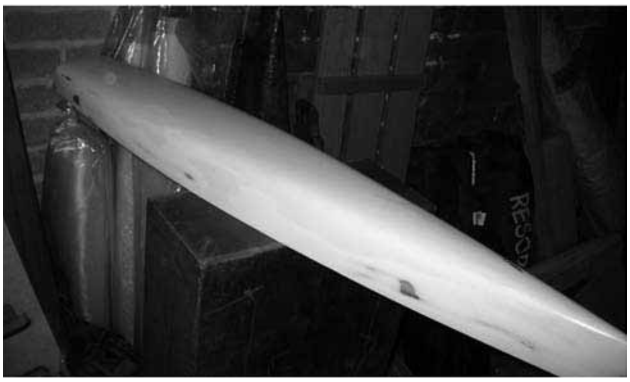

Figure 7 — The finished plug

To form the female mould, a thick gelcoat followed by many layers of chopped-strand fibreglass and a set of frames produced a good mould, as shown in Figure 8. From this mould exact copies could be made.

As previously mentioned, making the model to the correct scale mass proved the most challenging task of all. The challenge lay in keeping the model light, yet strong enough to handle the sailing forces. In all, seven hulls were made and only one was light and strong enough to be used as a

Figure 8 — The female mould

sailing model; another was slightly heavier and was able to be used as a towing model.

Hull No. 4, shown in Figure 9, ended up being the lightest hull. The first layer was 200 gsm, with a vacuum bag being used to hold the core down after just wetting the contact surface of the core before installing. The final layer of 25 gsm glass was applied with care, trying not to use too much resin as it would fill the cavities of the Nomex. The lightweight glass was difficult to work with, as it was easily snagged and pulled out of shape. Even with a lot of care, a little extra resin was used. This hull on release from the mould had a mass of 260 g, but was quite stiff and strong. After fitting out, with fin, rudder and radio control added, it came to a total weight of 780 g and was used for the live sailing model. This meant that, with the rig and keel weight added, the model was 1.770 kg, thus being slightly overweight for the model scale, but close enough to use for sailing.

Figure 9 — Hull No. 4 showing Nomex honeycomb core foils later moved to lower position

In the three subsequent models, fine silk was used as a reinforcement for the inner skin and a lighter 90 gsm fibreglass was sourced for the outer skin. The outer skin and the Nomex laying went very well, but there was some spillage of resin onto the Nomex during the laying of the inner silk skin. Out of the mould, Hull No. 6 had a mass of 340 g, and this hull was fitted with a canting keel to allow the model to run at the desired angle of heel in the towing tests, as shown in Figure 10.

5. TOWING TEST RIG

We had no towing-tank facility available for low cost, and so designed and built a test rig to measure the resistance of the model for a range of speeds while providing the motive force to bring the vessel to the foil-borne condition. The resulting machine turned out to be easy to use, portable and reliable.

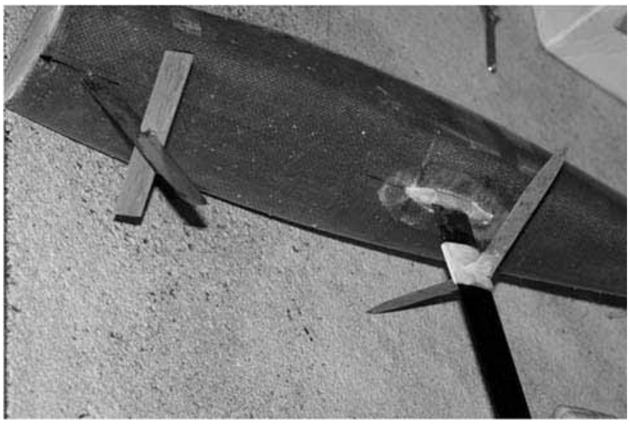

Figure 10 — Towing model with canting keel, note foil on centreline

The concept was that the model would be pulled through the water by a light nylon fishing line which was wound in by the machine. The machine, in turn, gave a tension reading on a linear spring scale from this nylon line and thus gave the force required to tow the model. Although the nylon line in the water added a small component of resistance, this was disregarded.

The towing apparatus needed various speed settings in order to obtain the different speeds through the water. Speed control was achieved by the use of an electronic controller with negative feedback of the voltage output. This speed controller was built with parts readily available from an electronics store. With a constant voltage, regardless of the load, the model could be towed at a constant velocity.

A simple voltage regulator was incorporated to stabilise the towing speed. Regulated power delivery is very useful when selecting a desired speed especially if the speed is in the early stages of the planing or foilborne regions. As a model approaches foilborne speed, it encounters a resistance hump and the speed controller applies extra power to pass through this hump and into the foilborne mode. Once the model is foilborne, the resistance is decreased, resulting in reduced power requirements. This allowed us to obtain results near the resistance hump.

However, a simple controller would keep on supplying the power required to pass through the hump, even when foilborne, and would cause the model to accelerate to much higher speeds. Also, if the simple controller were to be set at the power requirement of just being foilborne, then the model would never pass through the resistance hump. A simple controller would miss out on some of the most important data needed for this project. Trial-and-error was used in selecting the correct electrical variable resistor setting which would give a desired power output range needed for the models.

The completed towing apparatus is shown in Figure 11.

The crux of the towing apparatus is its ability to give a reading without the influence of internal friction. Elimination of the internal friction component is achieved with a vertical mast which is perpendicular to the incoming nylon line. On top of the mast is a lightweight pulley, over which the line travels, and then down parallel to the mast and onto the winding spool. Any friction due to the pulley on the top of the mast is transmitted vertically through the mast and not in the direction of the incoming line, so the friction causes

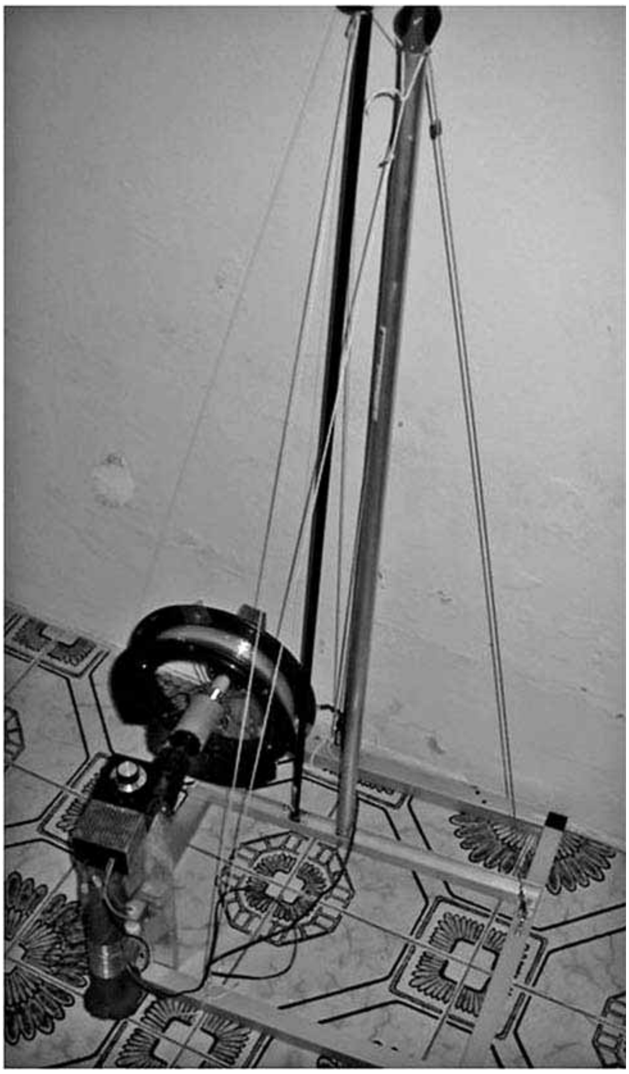

Figure 11 — Towing apparatus

no moment on the mast structure. The mast is able to rotate about its base and move in the direction of the incoming line. A spring gauge is attached to one side of the mast to give readings of varying incoming line tensions.

A radio-controlled rudder on the model enabled it to be steered in a straight line towards the towing machine. A slight deviation off course (five degrees or less) would not significantly influence the results. An advantage of using the nylon line is that there is a small amount of elasticity in it whereby any small waves or any slight deviation of the model does not instantly translate into a change in the tension at the towing apparatus. Thus a constant tension can be measured while the model is still some distance from the towing apparatus.

6. EXPERIMENTS

6.1 Towing Tests

A preliminary set of trials with the towing rig was conducted in the open harbour in order to refine the process and iron out any bugs in the towing and resistance-measuring apparatus. After a period of trial and error, the towing tests proved successful, and it was time to test the model in a more controlled environment.

The Swimming Pool at the University of New South Wales was selected for the trials, one of the advantages being that distance and time could be accurately measured. Many towing runs were conducted without foils to simulate the conventional hull, with speed and resistance being recorded. Runs were then made with the foils fitted and, again, speeds and resistances were measured. An example is shown in Figure 12.

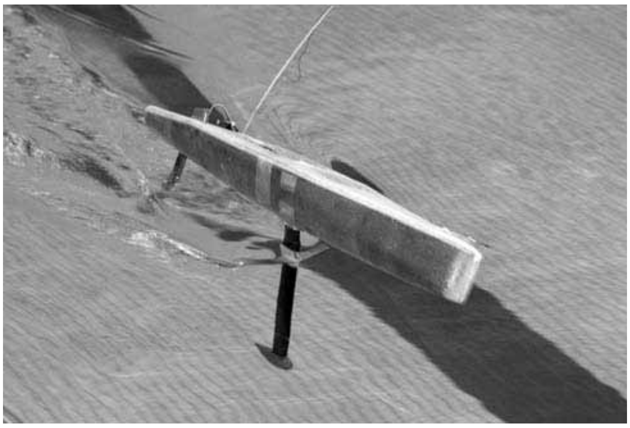

Figure 12 — Model foilborne with tips just breaking the surface at 1.74 m/s

Once the vessel was foilborne, any small waves which were present seemed to have very little impact on the way the vessel behaved. Thus small wave conditions might be a more ideal testing scenario for the model in both foilborne and conventional-yacht configurations, as it simulates the true operating environment of an ocean-going yacht.

The model required a speed of around 1.74 m/s (16.9 kn at full scale) to become foilborne. However, once foilborne the speed could be slowed to 1.55 m/s (15.0 kn at full scale) and still remain foilborne.

The resistance results are shown in Figure 13, and bear a marked similarity to the numerical predictions which were made in the early design stage (Figure 4), thus verifying the predictions.

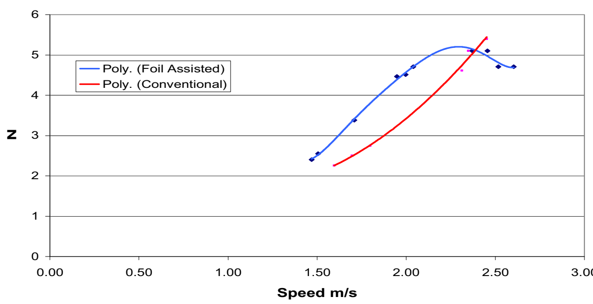

Figure 13 — Resistance results for conventional and hydrofoil hulls

6.2 Sailing Tests

A set of sails (main and genoa) and rig was designed, built and fitted to the vessel, as well as radio-control gear. The overall mass ended up approximately 130 g (8%) above the scaled displacement.

Scaling of the wind strength also plays a part in modeling sailing trials. A maxi-yacht sails in winds of up to 40 or 50 kn, so the model could be expected to sail in 10 kn, with average wind speeds of 5–6 kn. This is a light breeze, and there are often periods of associated calm. The mast on the model is 1.5 m tall, and the wind gradient can be extreme at this level.

In all, five sailing trials were conducted, each one an improvement on the previous trials and with many lessons being learned along the way. The first trial was a near-disaster, with the model almost sinking! However, the proof of the pudding is in the eating, and the fifth trial was the most successful. The model became foilborne at about the same speed as the towed model (estimated rather than measured). Figure 14 shows the model up on the foils.

Figure 14 — Model reaching on foils

7. CONCLUSIONS

The concept of a hydrofoil racing yacht has been investigated in this project. A 30 m Reichel-Pugh design has been used as a basis, and resistance calculations done to show that speed advantages by way of lower resistance) can be achieved in the range of 15–25 kn. Two models were then built at 1:25 scale, and towing and sailing trials conducted. The results show that this concept works — at least in model form.

Implementation at full scale may not be easy; there will be problems with structure, control and berthing arrangements. Some of the problems can be solved relatively easily, such as by using retractable foils to reduce resistance below foilborne speeds and obviate berthing difficulties; some problems are more difficult to solve. However, canting keels are not without their problems either (and not all have yet been solved), but canting keels are now firmly entrenched for the go-fast enthusiasts. Many factors give a full-sized yacht advantages over the model where hydrofoils are concerned: the ability to trim sails, have an active main foil, and an adjustable rear foil.

It is the author's belief that when one enthusiast takes the plunge and fits hydrofoils to a full-sized yacht, then the speeds achieved will convince more to follow.

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THE INTERNET

World's First Solar Speedboat

The Czeers MK1 prototype is, as far as its Dutch creators are concerned, the world's first solar speedboat. The Delft Technical University Solarboat Team built the original platform as an entry in the 2006 Nuon Frisian Solar challenge, which it easily won — and, in the process, attracted serious investment power from Rabobank to get a full-scale test boat built.

The resulting test boat, made from 100% carbon fibre, inlaid with leather trim, photovoltaic cells on almost all horizontal surfaces and an LCD touch-screen control system, was launched at the Millionaire Fair in 2007, and has since proven itself at up to 30 knots on the water.

The 10 m boat manages to pack in 14 m^2 of solar panels and an 80 kW electric motor. It uses no oil, produces no fumes or engine noise, and quietly generates all its own power in a completely sustainable fashion. For further details, photos and a video of the craft in action, visit www.gizmag.com/the-worlds-first-solar-speedboat-czeers-mk1/9372/.

Martin Grimm

Google Maps

Google Maps has added a new feature which has caused something of a stir and, if you haven't already seen it, it is well worth a look. Go to the usual www.google.com/maps, type an address into the Search the Map box, press Enter and the map of the street and surrounding area will come up. In addition to the usual Map, Satellite and Terrain buttons, you can now click on the new Street View button and you will get a view of the house at that address from the street level. This view can be panned in all directions, and you can move up or down the street, and into other streets, and look at other houses (in Australia and the US only, at present)!

Phil Helmore

EDUCATION NEWS

University of New South Wales

Undergraduate News

Inclining Experiment

Sydney Heritage Fleet provided access to their yacht *Boomerang* for the third-year students to conduct an inclining experiment at Rozelle Bay on 14 May. The students conducted the experiment with the guidance of lecturer Mr Phil Helmore. The day was perfect for an inclining; fine and sunny, with no breeze the whole time. The experiment was completed in record time, and the students made a good fist of their first inclining. The theory of stability is fascinating, but seeing it in practice at an inclining makes it come *to life* for the students.

Thesis Topics

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

Hydrodynamic Performance of T-foils

Ryan Ayres is investigating the hydrodynamic performance of T-foils as ride-control devices. He has already conducted preliminary tests of a T-foil in the large wind tunnel in the aerodynamics laboratory to establish a baseline. He will also test the same foil with a series of end plates to find the change in performance due to the improvement in effective aspect ratio, and compare the results with those obtained from computational fluid dynamics modelling of the flow for the various cases.

Use of Satellite Navigation for Sea Trials

The number of measured-mile distances available for speed trials in Australia is slowly reducing, and the use of differential GPS is now well established for the conduct of speed and manoeuvring trials. However, the use of standard satellite navigation systems for sea trials is not well established. Nichola Buchanan is investigating the accuracy of the principal systems, including the US GPS, European Galileo and Russian, and comparing these with the accuracy required for the principal types of trials, in order to establish a guide to which systems are suitable for each type of trial.

Novel Design of Rudder Stock

Greg Laanemaa is investigating a novel design of composite rudder stock in association with EMP Composites. The rudder/stock combination is being analysed using finite-element software to establish the stress-deflection patterns and to optimise the layup. A full-size rudder and stock will then be laid up and subjected to a four-point bend test in the Instron rig to validate the finite-element calculations.

Post-graduate and Other News

Engineering Alumni Dinner

The Engineering Alumni Anniversary Dinner for 2008 will be held on Friday 26 September 2008 in Leighton Hall, Scientia Building, for the graduates of 1958, 1968, 1978, 1988 and 1998. So, if you graduated with John Lembke and Scott McErlane (1998), David Shelton (1988), Mike Claffey and Peter Rout (1978), or Richard Caldwell and Philip Hercus (1968), then you should have dusted off the tux or cocktail dress, polished your shoes and asked your partner to keep the evening of Friday 26 September free. Bookings opened in July so, if you haven't already, make yours with Celine Oerlemans on (02) 9385 4023 or c.oerlemans@unsw.edu.au.

Check the Engineering website www.eng.unsw.edu.au/news/index.htm for the latest details.

Phil Helmore

Australian Maritime College

AMC receives a Special Delivery

It's taken more than 20 years, but the Australian Maritime College's Towing Tank and Model Test Basin achieved a major milestone thanks to a very special delivery on 11 July 2008. The AMC reached its 500th test model milestone within their towing tank and model test basin hydrodynamic facilities when Launceston model maker, Stuart Phillips, delivered his hydroelastic, carbon-fibre scale model of a frigate to the team working on a project with long-time AMC research collaborator, the Defence Science and Technology Organisation (DSTO).

Towing tank and test basin manager, Gregor Macfarlane, has kept track of the numbers so he knew number 500 wasn't too far away. "Years ago I estimated that some time in 2008 we'd reach our 500th model and, when I counted them up a few weeks ago, we were at 494. So this is officially our 500th" he said. "It's a very complex model and it's been built by Stuart Phillips, who has constructed the majority of our most-challenging hydrodynamic test models over the past two decades. It is also satisfying in that this model is for one of our major research collaborators, the Maritime Platforms Division of DSTO, with whom we have had a good relationship for many years."

Stuart Phillips is somewhat of a rarity in Tasmania. Full-time model makers may be easy to come across in cities like Melbourne or Sydney, but they are thin on the ground in Stuart's adopted home state. Stuart's model-making career in Tasmania has been closely linked to the AMC.

"I came here in 1983. A friend and I started out in a boat yard and one way or another I went back to my life-long trade of making models. In Sydney I worked for a couple of model-making companies and then started my own business, and I've been working for myself for about 35 years," he said.

"Working with these guys (AMC) has been a fantastic experience, it really has. Someone introduced me to Martin Renilson, who was the manager of the facility at the time, and they were looking for somebody because there wasn't any such thing as a full-time model maker in Tasmania at the time. I had arrived from Sydney and one thing led to another. I tried it once and the rest is history."

The "history" which he mentions can be seen in corridors and hallways, in tanks, and even suspended from ceilings around the AMC. Scores of yellow models are testament to coursework and research undertaken over the years. Valued at anywhere between $2000 to $60 000, they are a catalogue of the country's modern maritime history. The range is incredible, from America's Cup and other high-performance racing yachts to military vessels, high-speed car/passenger vessels, luxury pleasure boats, tugs, patrol boats, fishing vessels, semi-submersibles, offshore oil rigs, submarines, autonomous underwater vehicles, and even special-purpose buoys.

The models are also testament to the local model makers, Stuart, Les Richards, Ian Milner and Liam Honeychurch, who have seen their craft evolve over the years to keep pace with the technological demands of AMC's clients, collaborators and testing facilities.

"The most challenging models have probably been this one and one we did for Incat in Hobart recently, the 112 m cat which was delivered to Japan," Stuart said. "The purpose of this 500th model is to study the motions and loads on the vessel, so the model is made in a number of segments. Between each of those segments they have instrumentation so they can pick up the loads at each of those segments and can isolate just where it's happening in the vessel. It was first tried on a model for Incat and that proved to be spectacularly successful, so this is a continuation."

Stuart has a simple reason for building models for AMC. For him, it's the perfect mix of all the elements which make it a dream job. "I love boats and ships, I enjoy working on new things all the time, I enjoy the research side of it. Working with these guys here — they are a very, very innovative group of guys, a very talented group of guys and they are very easy to work with," he said.

"It's just a total package for me — it's doing what I love, I'm working with new technology all the time and we're pushing that. The guys here are pushing the technology and the research too, and they rely on me to push the technology to keep up with their designs."

The feelings are mutual, according to Gregor Macfarlane. "We're very lucky to be able to access the great skills of Stuart Phillips," he said. Gregor sees the 500th model as a marker in the AMC's history. Its hi-tech design shows how far things have come since the early days. "Martin Renilson got the towing tank up and running. They didn't just start AMC and there was a towing tank ready to go. There was a basic concrete tank with no rails, no carriage, no wave maker, nothing. So it was all done on a shoestring in those days — 'we'll get this this year and that next year'," he said.

"It officially started in around 1984 with our first tests and it has built up to where it is now — it's always booked out at least a couple of months in advance."

While Stuart Phillips has been the main model-maker for the AMC, new methods have been incorporated as well. "There's a mix of model construction methods used these days, ranging from traditional methods by hand, through to the use of computer-controlled machines. Some models are more suited to one method over others. We build some models in house, but it's great for us to have this local expertise which we can access," said Gregor. The time to construct a typical model averages around three to four weeks, but development models can take up to three months. The average cost is around $4000 to $6000. "The most expensive model we have is worth around $60 000, which has all the special toys in it — propulsion system, motion sensors, auto pilots, various other items of instrumentation — all those bells and whistles."

Unlike some similar institutions, the models are treated with great respect long after their intended testing value has gone. Gregor sees their importance well beyond the towing tank or test basin, and regards them more as a collection than an assortment of leftovers. "We have a policy that we look after our models here at AMC. Some places around the world will store them for a few months then destroy them, but we like to keep ours," he said. He also likes who and what the models represent — long-term clients, research collaborators and long-standing relationships. For instance, Brisbane-based boat builders and designers, Norman R. Wright and Sons, have been coming to AMC for more than 20 years. "They're a family business and we've had a really good relationship with them for a long time. On average, they've tested at least one of their boats with us each year since the mid 1980s," Gregor said.

Perhaps the biggest acknowledgement of the link between the AMC and the models came earlier this year when Stuart Phillips received an AMC Council Award for his contribution to the AMC. It's the official seal that the models are as much a part of the AMC's work as the people and the facilities in which they are tested.

Stuart Phillips with the 500th model in July 2008
(Photo courtesy AMC)

AMC and UTAS Research at Forefront of High Speed Ferry Industry

Two APA(I) postgraduate scholarships are available at the University of Tasmania and the Australian Maritime College to work on an exciting Australian Research Council-funded project in partnership with Incat and Revolution Design. The ongoing research project into wave and slamming loads on commercial and military high-speed ferries will receive $290 000 through the Australian Research Council over three years.

The tax-free PhD scholarships, of up to $36 000 per annum, are available for work in the areas of structural and fluid dynamics, mechanical vibrations, model-scale experiments and full-scale measurements. Final-year degree students and graduates of all engineering disciplines are encouraged to apply to: Dr Giles Thomas telephone (03) 6335 4883 or email G.Thomas@amc.edu.au

Further project information is available at: http://academic.amc.edu.au/~gthomas/incat/incat.html

Novel Gas Cat Investigation

A novel LNG floating production and storage facility is currently being investigated at the AMC in collaboration with Woodside and WA Energy Research Alliance (WA-ERA). Final year students Landon Kibby and Sasha Ford are conducting the work under the supervision of Dr Giles Thomas with support from Dr Jonathan Binns and Mr Timothy Lilienthal.

This exciting student project is proudly sponsored by Woodside which is a strong supporter of Australian universities and was a founding partner with WA-ERA in its first alliance with industry. Woodside is keen to nurture talent and has a growing demand for talented naval architects and offshore engineers, as it develops large gas fields off the northern Australian coast in remote, cyclonic settings. Physical testing of scale models under simulated extreme weather provides an excellent learning opportunity for young engineers.

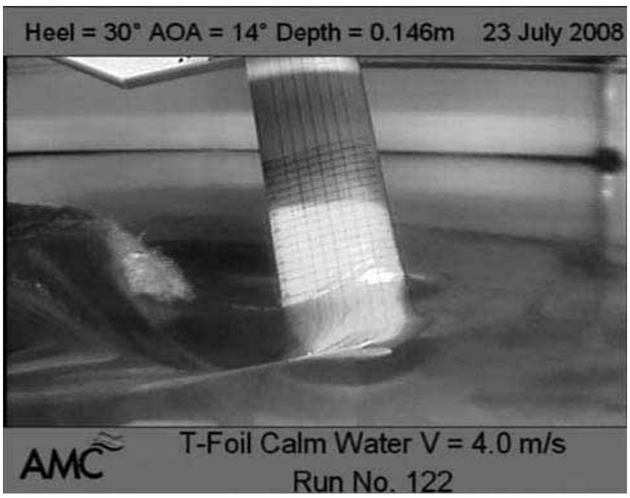
Woodside do not have an opinion yet about the feasibility of this novel gas cat concept — it's very early days — and it is one of a number of non-traditional solutions which are emerging in industry and academia, some of which will go on into deployment and many will not.

Giles Thomas

The French Connection — T-foil testing at AMC

In July 2008, French students Julien Plouhinec, Loïc Draoulec and Gaël Fechant from École Nationale Supérieure d'Ingénieurs (ENSIETA) conducted further T-Foil experiments under the supervision of A/Prof. Paul Brandner and Dr Jonathan Binns (see page 39, *The ANA,* February 2008). This project is a continuation of a final-year research project looking at a generic T-foil which has the same dimensions as an aft foil attached to the rudder of a Moth skiff. A full repeat of the experimental program conducted last year was completed with additional experiments performed, including investigation of the full lift slope, ventilation of the foil and measurements of forces due to fence deflectors. This project marks the busiest time for the large six degree-of-freedom force balance.

Jonathan Binns



Foil slowing down after ventilation
(Photo courtesy AMC)

Loïc, Julien and Gaël during testing
(Photo courtesy AMC)

$4 million dollar Simulator Upgrade sets Sights on Skills Shortage

Thanks to a newly-signed contract between the Australian Maritime College and Kongsberg Maritime, one of the world's leading maritime-training simulators at the AMC in Launceston is about to be upgraded.

The upgrade, worth in excess of $4 million, means students and industry will have access to the very latest in maritime technology, with real-life simulations across a range of vessels, ports and conditions. The move not only cements the AMC's role as a world leader in maritime education, but is a direct response to a major skills shortage in the booming global maritime industry.

According to the head of the AMC's National Centre for Ports and Shipping, Captain John Lloyd, the upgrade will have ramifications well beyond the Launceston campus. "The simulator is an area where the AMC and industry already work very closely together. This upgrade is essential if we are to keep ourselves and the companies who seek our expertise at the forefront of the industry," Captain Lloyd said. "Traditionally, AMC has led the way with maritime education and research facilities, and this is a continuation of that role at a time which is crucial for shipping around the globe."

The simulator upgrade will include a 270° main bridge, six ship operating consoles, 160° bridges with re-configurable cockpit consoles, and a 180° tug bridge. The various bridges will interact, creating real port situations in a range of weather conditions. Research and development stations to further the AMC's capacity to deliver training and research projects are also included.

Captain Lloyd said that the decision "only came after careful consultation with key industry figures. The selection of Kongsberg Maritime to meet AMC's simulation requirements comes as a result of a careful evaluation of international suppliers. The system being delivered will ensure that AMC remains at the forefront of maritime training and research in the Australian region."

National Maritime Training Alliance takes shape in Launceston

The Australian Maritime College has hosted the first meeting in an initiative towards an alliance between the country's biggest providers of maritime education and training.

The Maritime Training Alliance (MTA) between the AMC, Western Australia's Challenger TAFE and the TAFE NSW — Hunter Institute would mean a clear pathway from vocational training to the AMC and the University of Tasmania.

Director of the AMC's National Centre for Ports and Shipping, Captain John Lloyd, said "the approach between the three organisations will allow for uniformity of courses and teaching approaches across seafaring in Australia. Ultimately, the move will see a strengthening of maritime education, leading to increased benefits for industry".

Aimed at making training more collaborative and responsive to industry needs, the agreement between Challenger TAFE, Hunter TAFE and AMC began to take shape at an initial meeting at the Australian Maritime College in Launceston recently.

The collaboration is partly funded under a Reframing the Future project, through the Department of Education, Employment and Workplace Relations. A second meeting to progress the MTA will be held in Fremantle in August.

AMC improves Learning Outcomes for Students

A research project involving AMC staff aimed at improving learning outcomes in first-year engineering has just received a $148 000 research grant.

The AMC's Dr Giles Thomas and Dr Anna Carew, in conjunction with the University of Wollongong, UTAS and the University of Technology Sydney, obtained the grant from the Australian Learning and Teaching Council for their project — *A proactive approach to addressing student learning diversity in Engineering Mechanics*.

The project arose from the increasing learning diversity among students studying engineering mechanics. The unit features widely throughout Australian institutions, but failure rates between 20 and 50 percent for introductory mechanics are common.

The aims of the research are to determine the factors contributing to the high failure rates and to develop a publicly-available learning resource for engineering mechanics and a guide to its application.

Funding for Climate Change Education and Training

The Australian Maritime College and the University of Tasmania have recently been awarded government funding for the development of climate-change adaptation programs. Senator Penny Wong, Minister for Climate Change and Water, made the funding announcement. $1.9 million was awarded to tertiary institutions and professional associations to integrate climate change into their education and training courses through the Climate Change Adaptation Skills for Professionals small grants program.

UTAS received $111 988 for the mainstreaming of climate-change adaptation into existing postgraduate education, to train planners of both built and natural environments and for developing climate-change courses and resources. The AMC received $136 996 to investigate the development of climate-change adaptation short courses and training for maritime professionals.

The Climate Change Adaptation Skills for Professionals Program provides grants to tertiary education and training institutions and to professional associations, funding the revision or development of professional development and accreditation programs geared towards architects, engineers, natural resource managers and planners.

For more information about the Climate Change Adaptation Skills for Professionals Program, visit http://www.climatechange.gov.au/impacts/index.html

Reconfigurable Hull Form concept for High- and Low-speed Operations

Many vessels are required to travel within two distinct speed ranges, high-speed sprint and low-speed cruise. However, it is difficult for the naval architect to design a hull which is capable of high speeds but is also efficient at low speeds. Hence, the resulting hull form will be a compromise for both speeds.

As warships are required to have a high-speed sprint capability, together with high endurance and low acoustic signature at low speeds, this is of interest to DSTO, and they are funding work in this field at AMC.

The AMC concept, which is being led by Professor Martin Renilson, couples a wide transom and waterjet propulsion for speeds as high as 40 kn, with a conventional stern and propeller propulsion for low speed operation. This follows on from work Professor Renilson did whilst at QinetiQ in the UK.

As part of this project a final year student, Andrew Gazal, has designed a suitable hull form with a wide transom for the high-speed operation, and a canoe-style after body which can be lowered into place for the low speeds. An interceptor is deployed at high speeds, but retracted for low speeds.

A model has been constructed and tested in the towing tank in both configurations. This has included optimisation of the interceptor immersion for the high-speed operations, and tests over three displacements to investigate the effect of displacement on the results, as the concept will result in an increased displacement.

Currently the results are being analysed, and predictions will be made regarding the fuel savings possible over the lifetime of a vessel.

Andrew Gazal and Professor Martin Renilson with the scale model of the reconfigurable hull form
(Photo courtesy AMC)

THE PROFESSION

Issues Paper on Watertight and Weathertight Integrity

The National Marine Safety Committee (NMSC) recently announced the release of an Issues Paper on a new national safety standard for watertight and weathertight integrity of commercial vessels. For the last 30 years, small commercial boats, such as fishing boats and passenger charter boats, have had to protect themselves against heavy weather in the same fundamental way as have international cargo ships. The Issues Paper proposes various options for the development of the new National Standard for Commercial Vessels (NSCV) Part C, Subsection 2 — Watertight and Weathertight Integrity.

NMSC's CEO, Maurene Horder, said that the Issues Paper questions the requirement for all vessels to adhere to the International Load Lines Convention's ways of protecting boats from heavy weather. "Many vessels which are 24 m in length or more have to meet all the requirements of the Convention, which includes things like the height of vents, the construction of windows and the number and size of freeing ports," Ms Horder said. "They also have to have a 'load line' marked on the vessel's side".

The paper explores options for protecting vessels from the ingress of water in heavy weather by their watertight arrangements. "For example — watertight doors, coamings, portholes, deadlights and other things like freeing ports and minimum freeboard," Ms Horder said. "The design of commercial vessels has been undergoing some radical transformations since the mid-1990s when the Code of Safety for Dynamically Supported Craft was developed — it is time that some of those changes filtered down to smaller commercial vessels in a formal way," she said. "It is not reasonable to expect small vessels, which are never loaded as heavily as are the big ships on international voyages, to meet the same requirements to protect against heavy weather".

The paper also considers whether the international High Speed Craft Code should be used as a basis for the new standard, whether classification society rules might be used, or if the standard should start anew.

The new standard will be closely tied to NSCV Part C, Section 6B — Buoyancy and Stability after Flooding, which is currently under development. The NMSC is particularly interested in hearing from people who have either experienced vessel operations in heavy weather, or have had to repair, survey or design vessels which have been or are subject to heavy weather.

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

Public comment is now sought on the Issues Paper. Copies can be downloaded from the NMSC website www.nmsc.gov.au or obtained by phoning the NMSC Secretariat on (02) 9247 2124. The period for public comment closes on 18 September 2008, so get your copy today and comment away!

Issues Paper on Hire-and-drive Vessels

The National Marine Safety Committee (NMSC) has released for public comment an Issues Paper on the review of the current requirements for hire-and-drive vessels. The current requirements in Section 18 of the Uniform Shipping Laws Code date back nearly thirty years, and it is proposed to replace them with a new standard which will form part of the National Standard for Commercial Vessels (NSCV), Part F, Section 2.

NMSC's CEO, Maurene Horder, said that a preliminary workshop which was held in March identified a range of issues to be considered in the review, including the need to take account of the range of hire-boating activities currently on the market and emerging around Australia. "These newer activities include off-shore bareboat chartering, hiring a boat on a trailer, and jet ski hire," Ms Horder said. "However, traditional hire-and-drive activities like houseboats, off-the-beach boats and day-outing power boats are also still popular and need to be catered for in the new standard."

The March workshop also identified many existing standards for the design and construction of boats used in this sector — such as those applied in North America and Europe — which might be referenced rather than creating a uniquely-Australian set of requirements. Those overseas standards, and the associated conformity assessment programs, are discussed in the paper, with comment being sought on whether or not they would provide an appropriate solution in the Australian context.

Even the title of the new standard is not fixed. Ms Horder said that some people have indicated that the term "hire-and-drive" does not adequately describe the full range of activities of vessels in this sector today, and that the NMSC is happy to hear suggestions on a better way to describe them. "The standard needs to reflect community attitudes to acceptable levels of risk, and that's why public feedback is so important," she said. "It will be important to strike the correct balance for the requirements which protect public safety, without placing unnecessary restrictions on people's right to enjoy themselves on the water".

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

Public comment is now sought on the Issues Paper. Copies can be downloaded from the NMSC website www.nmsc.gov.au or obtained by phoning the NMSC Secretariat on (02) 9247 2124. The period for public comment closes on 22 September 2008, so get your copy today and comment away!

NSCV Communications Equipment Endorsed

The Australian Transport Council of Ministers has endorsed a new national safety standard for the carriage of communications equipment for safety and distress purposes on board commercial vessels. The new standard, developed by the National Marine Safety Committee (NMSC), forms part of the National Standard for Commercial Vessels


Fast craft standard heads for national legislation
Photo by M. Flapan

New laws for NSCV from October 2008

The National Standard for Commercial Vessels (NSCV) has reached a major milestone as it now officially forms part of the Uniform Shipping Law (USL) Code. The Combined USL/NSCV 2008 brings into force some of the construction and equipment sections of the NSCV approved before 2008.

What does it mean?

The maritime industry can benefit from the ease of applying nationally-legislated standards.

From 1ST October, requirements of the NSCV will apply throughout Australia* to sections of the NSCV in:

- structural fire protection
- life-saving appliances, and
- engineering
- fast craft

*with minor variations in some States and Territories

National Marine Safety Committee

Find out more: Go to the NMSC website to view the Combined USL/NSCV 2008 www.nmsc.gov.au

(NSCV) Part C, Subsection 7B — Communications Equipment. It will replace the Uniform Shipping Laws (USL) Code's Section 12 — Radio Equipment and those parts of Section 13 — Miscellaneous Equipment which pertain to communications equipment.

NMSC's CEO, Maurene Horder, said that the national standard provides vessel operators with the whole range of smart-technology options which can be taken up according to a particular vessel's area of operation or class.

"In other words, this is a total update," Ms Horder said. "For example, when operating offshore, a vessel operator may have a choice of carrying either HF radio or satellite communications equipment — depending on which option suits the vessel's other operating requirements. That vessel operator may also be using satellite communications equipment for maintaining contact with their base of operations, or for other non-safety related communications".

The standard also includes references to the requirements for on-board communications equipment specified in other parts of the NSCV.

Significantly, the requirements for EPIRBs (distress beacons) have been moved from the general safety equipment standard (NSCV Part C Section 7A) into this new communications standard. The general safety equipment standard will cross-reference the move by amendment.

Ms Horder further explained "In addition to taking in the requirements for EPIRBs, the new standard provides a consolidated reference point for all other internal and external emergency communication equipment on board the vessel".

"Similarly, amendments to those parts of the USL Code to do with the licensing of radio operators or operators who are maintaining radio watches are being made to the other relevant sections of the NSCV — with references to these parts retained in this new standard," she said. "Overall, the standard provides an innovative and holistic approach to marine communications, so that a user who is unfamiliar with standards can pick up the communications section and find reference to all aspects of communications on a vessel".

The NSCV Section C7B — Communications Equipment can be downloaded from the NMSC website, www.nmsc.gov.au (click on Publications, then Commercial Vessel Standards), or in hard copy by phoning (02) 9247 2124.

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

Rosemary Pryor

Boating Fatalities Study Released

The National Marine Safety Committee released *The Boating Fatalities in Australia 1999–2004 Report* — a national analysis of fatal injury due to boating in Australia — at its Marine Safety Conference 2008 in Adelaide in May.

The study, written by Associate Professor Peter O'Connor, using information from Australian Bureau of Statistics data and coroners' files, shows that 241 people died in 196 boating incidents between 1999 and 2004, and a further 33 people were injured but survived.

NMSC CEO, Maurene Horder, confirmed that the data would inform decisions on marine safety policy and education programs in order to reduce injuries and fatalities on Australian waters. "Boating fatalities present a tremendous loss and strain on families and a huge cost to the community. Between 1992 and 2004, boating fatalities cost the Australian community $60 million per year and we estimate that, by this year, the total cost would have exceeded one and a half billion dollars", she said. Ms Horder explained that, combined with information from the earlier *National Assessment of Boating Fatalities in Australia 1992–1998 Report*, the NMSC now has comprehensive data on boating fatalities for the past 12 years. "For example, the two studies show that 574 people died in Australian waters between 1992 and 2004, an average of 48 people per year, 48 people too many in my opinion."

Main findings include:

- Environmental Conditions: Most of the incidents occurred in favourable environmental conditions (77% occurred in calm-to-moderate seas).
- Incident Events: The sequence of events resulting in a boating death was initiated most often by capsize of the vessel (19%), a person falling overboard (10%) or swamping of the vessel (11%). When all significant events were considered, a fall overboard was the most common event (33% of the events noted) while capsize was responsible for 16% of all incident events. These results were similar to the first fatality study.

- Contributing factors include:
    - The initial contributing factor in 74% of incidents was a human cause, mainly alcohol, (21%) or an error of judgement (10%).
    - Blood was taken for analysis for 69% of fatalities (n=166) and evidence of alcohol was available in a further 8 cases, totalling 174 fatalities. Forty percent (n=70) of the 174 fatalities were positive for alcohol: 22% (n= 38/174) in excess of .05 g/100 mL, demonstrating that alcohol is as much a factor in boating deaths as it is in road deaths (26% ATSB, 2001). Of the 154 tested for drugs, 25 (16%) were positive, mainly for cannabis (n=21). The involvement of drugs was greater than observed in the first national study (9%) but it is still an issue of cannabis use rather than other drugs.
    - When all contributing factors were considered, the top five were error of judgement, alcohol, failure to keep a proper look-out, hazardous wind and/or sea conditions and failure to wear a PFD.
- Personal Flotation Devices: People can double their chances of surviving just by wearing a personal flotation device (the first and second studies found that people found alive were two times more likely to have been wearing a PFD).
- Vessel Type: 81% of vessels were for recreational purposes and 19% were commercial vessels, mainly commercial fishing boats. However, dinghies continue to be the most common type of vessel involved in fatal incidents (36%).
- Vessel Length: 44% of the vessels were 4–6 m in length, with 74% less than 6 m. Average boat length was 5.9 m, an increase from the first fatality study (5.6 m).
- Vessel Power: There was an apparent large increase in the frequency of overpowered and overloaded vessels (when considered against the Australian Standard AS 1799 method for calculating the maximum engine power for existing vessels, which is known to be conservative, 74% of the vessels in which someone was killed were overpowered).
- Vessel Operator: People killed in boating incidents are older than observed in the first fatality study (94% of operators were male and 48% of operators were aged over 50 years, compared to 36% in the first study.)

Ms Horder said that the results of this survey would also be considered by the Australian New Zealand Safe Boating Group (ANZSBEG) to determine the topic for the 2008–2009 summer boating education campaign.

For further information, please contact CEO, Maurene Horder, on (0418) 655 203 or Communications Officer, Ursula Bishop, on (0412) 813 056.

Ursula Bishop

The Malaysian frigate, KD *Jebat* conducts replenishment-at-sea approaches with the RAN replenishment ship, HMAS *Sirius* during the recent Kakadu IX exercise off northern Australia
(RAN Photograph)

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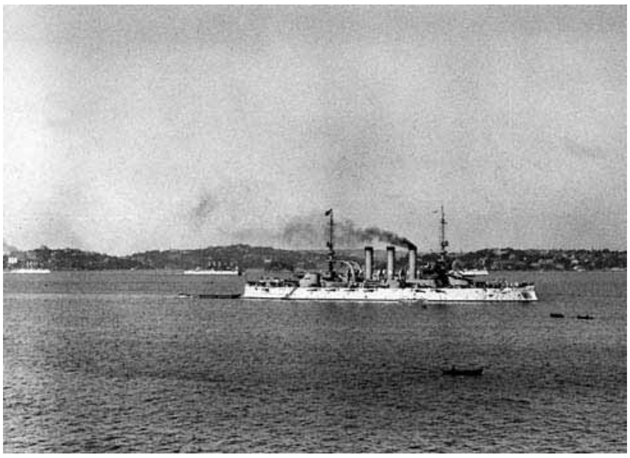
THE GREAT WHITE FLEET'S 1908 VISIT TO AUSTRALIA

We live in hopes that, from our own shores, some day a fleet will go out not unworthy to be compared in quality, if not in numbers, with the magnificent fleet now in Australian waters.

Prime Minister Alfred Deakin, August 1908 [1]

On 20 August 1908, well over half-a-million Sydneysiders turned out to watch the arrival of the United States Navy's 'Great White Fleet'. For a city population of around 600 000 this was no mean achievement. The largest gathering yet seen in Australia, it far exceeded the numbers that had celebrated the foundation of the Commonwealth just seven years before. Indeed, the warm reception accorded the crews of the 16 white-painted battleships during 'Fleet Week', was generally regarded as the most overwhelming of any of the ports visited during the 14 month and 45 000 mile global circumnavigation. The NSW Government declared two public holidays, business came to a standstill and the unbroken succession of civic events and all-pervading carnival spirit encountered in Sydney (followed by Melbourne and Albany) severely tested the endurance of the American sailors. More than a few decided to take their chances and stay behind when the fleet sailed!



The Great White Fleet at anchor in Sydney Harbour
(State Library of NSW 34366h)

One man undoubtedly well pleased with the visit's success was Australia's then Prime Minister, Alfred Deakin, who had not only initiated the invitation to US President Theodore Roosevelt, but had persisted in the face of resistance from both the British Admiralty and the Foreign Office. By making his initial request directly to American diplomats rather than through imperial authorities, Deakin had defied protocol, but he was also taking one of the first steps in asserting Australia's post-colonial independence. His motives for doing so were complex. He was, after all, a strong advocate for the British Empire and Australia's place within it, but he also wished to send a clear message to Whitehall that Australians were unhappy with Britain's apparent strategic neglect.

The security of the nascent Commonwealth might still ultimately depend on the Royal Navy's global reach, but the ships of the small, rarely-seen and somewhat obsolescent Imperial Squadron based in Sydney did not inspire confidence. As an officer in the US flagship observed during the visit: 'These vessels were, with the exception of *Powerful* (the British flagship), small and unimportant …Among British Officers this is known as the Society Station and by tacit consent little work is done' [2]. Equally galling to local opinion, the passage of the unpopular *Naval Agreement Act, 1903* had meant that, although Australia contributed £200 000 per annum for its upkeep, the Squadron could be withdrawn in times of danger to fulfill Imperial priorities. To many commentators this simply represented taxation without representation but, for those looking deeper, the implications were rather more disturbing. During even a transitory enemy cruiser raid, Australian commerce might face the choice of being driven into harbour or destroyed, while local ports could readily be threatened and held to ransom.

Feeling both isolated and vulnerable, it was easy for the small Australian population to believe that Britain was ignoring its antipodean responsibilities. The 1902 Anglo-Japanese Alliance (renewed in 1905), which had allowed the Royal Navy to reduce its Pacific presence, did little to alleviate these fears. Remote from the British Empire's European centre, Australians had no confidence that their interests and, in particular, their determination to prevent Asiatic settlement, would be accommodated in Imperial foreign policy. Japan's evident desire for territorial expansion, its decisive naval victory over the Russians at Tsushima in 1905, and its natural expectation of equal treatment for its citizens all seemed to reinforce the need for Australia to explore alternative security strategies.

Staunchly Anglophile, Deakin was not necessarily seeking to establish direct defence ties with the United States, but more than a few elements in Australian society were prepared to see in America the obvious replacement for Britain's waning regional power. A new and evidently-growing presence in the Pacific, the United States possessed a similar cultural heritage and traditions andas even Deakin took care to note in his letter of invitation, 'No other Federation in the world possesses so many features (in common with) the United States as does the Commonwealth of Australia' [3]. Attitudes towards Asiatics and, more particularly, hostility towards Japan, seemed likewise to be shared, particularly after a rise in Japanese immigration to the US West coast sparked riots in California and the passing of discriminatory legislation.

President Roosevelt had initiated the deployment of the US Atlantic Fleet to the Pacific — the first such movement of great battleships — to test his Navy's professionalism, arouse popular interest in and enthusiasm for the navy, and demonstrate that the United States had arrived as a world power. Wanting foreign nations to accept that the fleet should from time to time gather in one ocean just as much as it should in another, Roosevelt claimed publicly that the cruise was not directed against Japanese interests. Nevertheless, for most Australians the visit became an unmistakable expression of Anglo-Saxon solidarity; an 'essentially peaceful' mission, but simultaneously 'an armed assertion that the White Race will not surrender its supremacy on any of the world's seas' [4]. Unsurprisingly, the epithet 'Great White Fleet' only came into popular usage during the visit to Australia, and referred as much to race as it did to paint schemes.

No British battleship, let alone a modern fleet, had ever entered Australasian waters. So, with the arrival of the American vessels, locals were treated to the greatest display of sea power they had even seen. While the public admired the spectacle's grandeur, for those interested in defence and naval affairs it was an inspiration. This too was a part of Deakin's plan for, although he was a firm believer in Australia's maritime destiny, where defence was concerned national priorities still tended towards the completion of land rather than maritime protection. The Prime Minister's own scheme for an effective local navy was making slow progress and, like Roosevelt, he recognised the need to rouse popular support.

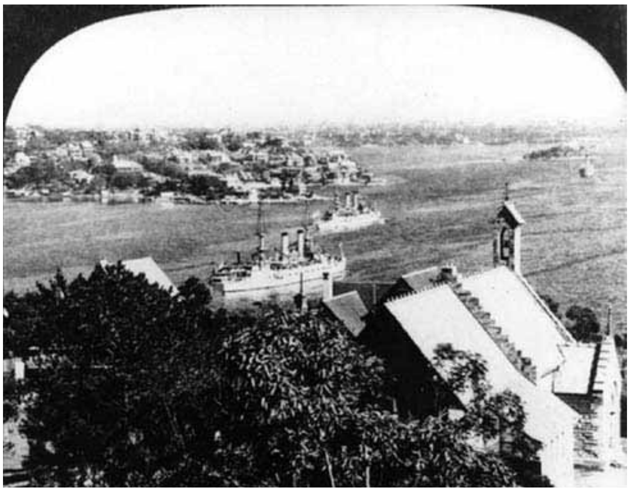
In this, the visit of the Great White Fleet played a crucial role, for it necessarily brought broader issues of naval defence to the fore, and made very plain the links between sea power and national development. Americans clearly had a real sense of patriotism and national mission. Having been tested and hardened in a long and bitter civil war, they were confident that the United States was predestined to play a great part in the world. Australians, on the other hand, still saw Federation as a novelty and their first allegiance as state-based. One English traveller captured well the prevailing mood. 'Australia', he wrote, 'presents a paradox. There is a breezy buoyant Imperial spirit. But the national spirit, as it is understood elsewhere, is practically non-existent' [5].

Aiming to foster both national unity and spirit, Deakin (a Victorian not overtly popular in Sydney) used the Great White Fleet's visit to demonstrate the community of feeling between the two nations, as well as to provide context for his own vision for a recognisably 'Australian' navy, one which he felt must be capable of announcing the nation's entry as a credible player on the world stage:

But for the British Navy there would be no Australia. That does not mean that Australia should sit under the shelter of the British Navy — those who say we should sit still are not worthy of the name Briton. We can add to the Squadron in these seas from our own blood and intelligence something that will launch us on the beginning of a naval career, and may in time create a force which shall rank amongst the defences of the Empire ….[6].

Deakin's party lost power before his plan could be set fully in motion, but he had laid the groundwork and established many of the essential elements. Most importantly, he had obtained Admiralty agreement to allowing full interchange of personnel between the British and Australian naval services. Without such unfettered access to technology and doctrine, a local fleet would most likely become a wartime liability; with it the Australian Navy would achieve major economies in infrastructure and training.

In February 1909, the new Prime Minister, Andrew Fisher, placed orders in Britain for three 700-ton destroyers, the first of up to 24 similar vessels which would allow Australia to take responsibility for its own coastal defence. The unsettled nature of local politics always made the completion of this plan unlikely but, in the event, it was overtaken by a far more daring scheme. In July, the British First Sea Lord, Admiral Sir John Fisher, proposed that Australia acquire a 'Fleet Unit'. Comprising a battlecruiser, several supporting light cruisers, and a local defence flotilla of destroyers and submarines, the 'Fleet Unit' represented an ideal force structure; small enough to be manageable by Australia in times of peace, but in war capable of efficient action with the Imperial fleet. Moreover, alone it would be strong enough to deter all but the most determined adversary in local waters.



US battleships *Kentucky* and *Kearsage* at anchor in Rose Bay, Sydney, in August 2008
(US Naval Historical Centre i00337)

The Director of Commonwealth Naval Forces, Captain William Creswell, had argued for years that the nation's 'sea efficiency' was 'the first and most urgent call upon responsible authority' [7]. Australia now stood poised both to accept this responsibility and to take an active part in the collective security of the Empire. 'In my judgement', Defence Minister, Joseph Cook, argued before the House, 'we are in these proposals, beginning, almost for the first time, to realize the promise of Federation … we shall turn over a new leaf in the book of our evolution. Our tutelary stages are past, our time of maturity is here' [8].

Parliament accepted the proposals and great efforts were thereafter expended to ensure that the navy would be a thoroughly and recognisably Australian force. On 4 October 1913 the first flagship, the battlecruiser HMAS *Australia,* and her escorts sailed into Sydney Harbour to a welcome no less enthusiastic than that accorded the Great White Fleet five years before. Just ten months later the fleet set out to face the harsh test of a brutal global war, and its professionalism was not found wanting. For a newly-acquired navy it was a remarkable achievement, and one which owed much to Deakin's foresight.

1. Cited in AW Jose, *The Royal Australian Navy,* University of Queensland Press, 1987 (reprint of 1928 edition), p. lviii.

2. Cited in JR Reckner, '"A Sea of Troubles" The Great White Fleet's 1908 War plans for Australia and New Zealand' in D Stevens & J Reeve (eds), *Southern Trident,* Allen & Unwin, Sydney, 2001, p. 191.

3. Cited in JR Reckner, *Teddy Roosevelt's Great White Fleet,* Naval Institute Press, Annapolis, 1988, p. 76.

4. *The Lone Hand,* 1 August 1908, p. 352.

5. J Fraser, *Australia: The Making of a Nation,* Cassell, London, 1911, p. 11.

6. Cited in Jose, *The Royal Australian Navy,* p. lvii.

7. Cited in GL Macandie, *The Genesis of the Royal Australian Navy,* Government Printer, Sydney, 1949, p. 252.

8. Commonwealth Parliamentary Debates, House of Representatives, 24 November 1909, p. 6251.

Reproduced from Semaphore*, No. 8, 2008 published by the Sea Power Centre — Australia,*

New Wärtsilä Simulator

Wärtsilä has installed a fully-functioning, state-of-the-art simulator at its training centre for Wärtsilä RT-flex common-rail low-speed marine engines in Winterthur, Switzerland. The simulator is primarily employed for training the personnel of ship owners and ship operators in the correct operation and fault diagnosis of the electronic control systems of Wärtsilä RT-flex common-rail engines. It enables a thorough understanding of both the Wärtsilä engine-control system used on RT-flex engines and the advantages given by the RT-flex system.

Hands-on training

The first feedback from training has been very positive. As the trainees from shipping companies are usually well-experienced sea-going engineers, they welcome the opportunity for real, hands-on training in the new technologies.

Not only does the simulator present an excellent visualisation of the RT-flex system and processes for better understanding by trainees, it also allows complete practical training on the RT-flex system. Trainees can be instructed in the exchange of electronic modules, and in the use of the versatile interface software flexView. Faults can also be fed into the simulator from a remote PC so that trainees can practise how to diagnose and remedy unexpected faults.

Simulator features

The simulator can also be used for demonstrating features of the RT-flex common-rail systems not only to customers but also to other visitors, such as students. It can moreover be used for testing and validation of new and modified RT-flex software before it is installed in the research engine and production engines.

The RT-flex simulator is set up with space to accommodate a class of 12 trainees. It comprises three principal components: the 3D model, an operating and control console, and a local engine control cabinet. The full-scale, multi-cylinder 3D model provides a visual impression of the action of fuel injection and exhaust valve actuation from the rail unit to the fuel and exhaust valves in the cylinder covers. It incorporates standard RT-flex control cabinets with the actual electronic equipment as employed in the Wärtsilä engine-control systems on production RT-flex engines.

The console has the same controls and displays as are fitted to the consoles in a ship's engine-control room and wheelhouse. The local emergency control panel is identical with those on the engines themselves. Thus the virtual engine can be started from the console and put through all its manoeuvres as if it were a real engine. The response of an RT-flex engine to signals from the Wärtsilä engine-control system is simulated by a separate computer which generates signals to the visual displays, the console and local control cabinet.

The simulator uses the latest Wärtsilä engine control equipment, as in the WECS-9520 system. However, it can be updated to incorporate future developments in RT-flex systems in parallel with engine developments.

An important feature of the simulator is its possibility to exchange the console and local control cabinet for the various individual types of propulsion control systems specified by Wärtsilä for RT-flex engines. Thus the simulator can be adapted to the actual configurations of control systems, customized as in the existing ones on board ships.

The RT-flex simulator in the WLSA training centre for low-speed engines in Winterthur
(Photo courtesy Wärtsilä)

SCHIFFKO becomes Wärtsilä Ship Design Germany

Wärtsilä Corporation has re-named its Hamburg-based ship design company SCHIFFKO GmbH to Wärtsilä Ship Design Germany GmbH. The change is effective from 1 June 2008. The name SCHIFFKO is retained as a product name for the company's ship designs.

Wärtsilä acquired SCHIFFKO GmbH at the end of 2006 with the aim to create more value for its customers by combining its ship power solutions expertise with ship design knowledge.

"SCHIFFKO has very successfully provided marine consultancy and ship design services to its customers for 53 years. We will continue this tradition under the Wärtsilä name, and further develop our services to ship owners and shipbuilders", said Barend Thijssen, Managing Director of Wärtsilä Ship Design Germany GmbH.

The company specializes in the design of merchant ship series, most notably container vessels. It is furthermore active in the design of offshore vessels, like pipe layers and offshore construction vessels, and special vessels such as icebreaking research vessels. Wärtsilä Ship Design Germany also provides marine consultancy and newbuilding services.

Senitec Integrated into Wärtsilä

Senitec, the Swedish oil and water-treatment solutions supplier, has now been fully integrated into Wärtsilä Corporation, marking the final stage of the company's acquisition process.

Wärtsilä acquired Senitec in February 2007 and the company has operated as a separate legal entity under the name Wärtsilä Senitec AB. As of 1 June 2008, Wärtsilä Senitec has merged with Wärtsilä and now forms part of Wärtsilä Sweden AB.

"Due to the successful introduction of the Senitec sludge and bilge-water treatment equipment into the Wärtsilä portfolio, together with a marked increase in demand for both marine and stationary applications, a rapid increase in production capacity was acquired which secures continuous quality and customer satisfaction," says Tom Nyman, General Manager, Services Sales, Wärtsilä in Sweden.

"As a result, the Wärtsilä Senitec operations in Varberg will be moved to Gothenburg, with all employees offered relocation. Investments will also be made in Wärtsilä Sweden's facilities to ramp up unit production to 100 units per year. At the time of acquisition, Senitec AB employed five people. The number of employees is expected to grow strongly during the coming years," Nyman continues.

The move will further strengthen production, deliveries and service support for the equipment and systems, and all old and new customers are welcome to contact the global Wärtsilä network of companies for support with the Wärtsilä Senitec product solutions.

Another benefit of gathering Wärtsilä Senitec experts in Gothenburg is that we can improve the level of training for customers and personnel. Furthermore, a Wärtsilä Senitec separator is in production and will be installed in the Wärtsilä Land and Sea Academy in Subic Bay, The Philippines, after the summer.

As the Senitec name is established and well known in the market place, the bilge and oily water separator product line will be marketed as the Wärtsilä Senitec M-series and P-series respectively for marine and power plant applications.

Wärtsilä Senitec oily water separators, with a discharge of less than 1ppm (parts per million) of oil in the water, are designed and built for continuous operation, and are capable of cleaning 1 m^3/h, or 24 m^3/day, of sludge and bilge water.

Where larger volumes of sludge and bilge water are in question, the Senitec M-series includes the M2500 unit capable of cleaning 2.5 m^3/h.

More information and full details on the full range of Wärtsilä oily-water separation equipment can be obtained by visiting www.wartsila.com/senitec.

Wärtsilä Senitec oily-water separator M1000
(Photo courtesy Wärtsilä)

Wärtsilä acquires Global Ship Design Group Vik-Sandvik

Wärtsilä has acquired the global ship design group Vik-Sandvik, a leading independent group providing design and engineering services to ship owners and the shipbuilding industry worldwide. The value of the acquisition is €132 million, with an additional maximum sum of €38 million to be paid based on the performance of the business over the next three years. In 2007, Vik-Sandvik's turnover was €55 million and the profitability is on a very good level. The number of employees is 410.

This acquisition is a major step in Wärtsilä's strategy to strengthen its position as a total solutions provider and to be the most-valued partner for its customers. By combining ship design capability with its existing offerings in propulsion systems and automation, Wärtsilä will be able to provide more added value to its customers, with further growth potential in new lifecycle services. Wärtsilä's goal is to become the leading provider of ship design services in various segments.

"Vik-Sandvik's excellent know-how of ship design will further expand Wärtsilä's competitiveness. We will be able to offer our customers the best total solutions, regardless of equipment used. Our customers will have the freedom to choose the solution package which best suits their needs," says Mr Arne Birkeland, President, Wärtsilä Norway.

"For Vik-Sandvik, this deal represents an opportunity to develop our business, in a way that meets the requirements of the market. We could have continued alone, but being a part of Wärtsilä, a leading equipment and after-sales services provider with global presence, clearly has benefits. We believe this combination will create a unique and new kind of market leader", says Mr Svein Sandvik, Managing Director, Vik-Sandvik.

Vik-Sandvik will be integrated into Wärtsilä Ship Design within Ship Power. The acquisition is subject to relevant regulatory approvals, which are expected during the third quarter of 2008.

Vik-Sandvik specialises in the design of high-end offshore vessels, as well as product and chemical tankers and more specialised vessels. It has for decades been recognised in the offshore market for its innovative designs and has achieved a strong global market position. As a part of Wärtsilä, the company has great potential for strong global growth and expansion into new market segments.

The company has its headquarters in Fitjar, in Western Norway, and it has operations in Norway, Poland, India, Brazil, Serbia, Bulgaria, Turkey, Russia and China. Vik-Sandvik has up to now been wholly owned by the Sandvik family.

Currently, Wärtsilä's ship design operations are carried out at its German company, Wärtsilä Ship Design Germany, and future ship design services will be combined within Wärtsilä Ship Design.

Mr Arne Birkeland, 42, will be the head of the Ship Design unit. Mr Birkeland joined Wärtsilä in 2006, and currently holds several other positions within the company. Mr Birkeland is the President of Wärtsilä Norway AS, and a Vice President of Wärtsilä Ship Power Technology.

Wärtsilä Full-sized Research Engine in Winterthur, Switzerland

In May, Wärtsilä Corporation inaugurated its new RTX-4 full-scale, low-speed research engine in its Diesel Technology Centre in Winterthur, Switzerland. This large, RTX-4 research engine is employed in furthering the development of Wärtsilä low-speed marine engines to meet market needs such as further improved reliability, longer times between overhauls, greater fuel efficiency and lower exhaust-gas emissions, especially NO_X and CO_2.

The new, RTX-4 research engine is a four-cylinder low-speed two-stroke engine of 600 mm cylinder bore. Initially it develops 10 160 kW at a nominal speed of 114 rpm. The design of the engine allows the power output to be increased to develop technologies for future market requirements. The engine incorporates the latest RT-flex common-rail technology with integrated full electronic control of all engine processes: fuel injection, exhaust-valve operation, cylinder lubrication and air starting.

The RTX-4 was manufactured in co-operation with 3. Maj Shipbuilding Industry Ltd in Rijeka, Croatia, and began running in April 2008. In the short term, it will undergo a comprehensive test programme to optimize further the thermodynamic parameters and to validate the design. It will also serve as a powerful research tool to pave the way for future technological steps. The main areas of research with the new engine include engine efficiency, emission-reduction technologies, reliability of key engine components, ease of manufacturing and low maintenance costs. It has the flexibility to apply and test new components and technologies.

The research engine can be tested on any type of heavy fuel oil without restrictions on the fuel specification. Today this is of major importance as research can be undertaken using similar fuels as production engines in actual service. It will also allow future research into the capabilities of engines to burn even lower grades of fuel oil should the quality of future bunkers be expected to deteriorate.

The Diesel Technology Centre is a vital link in the process of applying new technical solutions to production engines. It serves as the forerunner to verify design ideas before field testing and commercial application. Furthermore, test engines are often run at specific loads far above those of production engines to identify risks quickly and to investigate raised design limits for subsequent product steps.

Exhaust emissions control

An important aspect of current engine development for the marine industry is the control of exhaust gas emissions. This will be an important focus of development testing on the RTX-4 research engine.

Yet the RTX-4 engine itself is equipped to meet the stringent local environmental-protection requirements. Whereas on board ships the emphasis so far is on integrated ways to control exhaust emissions such as through engine tuning, the RTX-4 engine has an extensive exhaust-gas after-treatment plant including a selective catalytic reaction (SCR) unit. This technology is capable of reducing the nitrogen oxides (NO_X) content in the exhaust gases by more than 90% from the level at the engine outlet.

The new set-up of the engine installation is prepared for the installation of all kinds of after-treatment technologies (particulate filters, scrubbers, etc.) to verify their practical application for future, more-stringent marine regulations.

Control, monitoring and measurement

The RTX-4 research engine has its own fully-enclosed control room for the control, monitoring and supervision of the engine operation. This control room has an integrated marine automation platform that controls the engine, the ancillary systems and the dynamometer.

Further, another integration platform for test measurements handles initially more than 1000 quasi-static channels at a rate of up to 100 measurements per second. This system interfaces with the emission measurement systems, a telemetry system for temperature measurement, the dynamic measurement chain with initially 64 channels, each at a rate of up to 36 000 individual measurements over each engine revolution and an interface with the automation platform for data exchange.

The new research engine is supported by a laboratory for testing engine components and systems, such as fuel injection equipment, exhaust valve drives and a spray/combustion chamber. Fuel-injection equipment can be tested using either gas oil, marine diesel oil or heavy fuel oil. There are also test rigs for full-scale RT-flex common-rail systems using actual RT-flex components both to test and evaluate the components and systems before applying them to actual engines and for long-term endurance testing.

The new Wärtsilä RTX-4 research engine
(Photo courtesy Wärtsilä)

Principal particulars of the research engines:

Engine designation	RTX-4	RTX-3
Year installed	2008	1995
No. of cylinders	4	4
Cylinder bore, mm	600	580
Piston stroke, mm	2250	2416
Nominal speed, rpm	114	105
Power output, kW	10 160	8500
Mass, t, about	200	230
Dimension, L×W×H, m	11.0 × 9.7 × 10.8	9.1 × 8.3 × 10.8

Wärtsilä and Mitsubishi join Forces

Wärtsilä Corporation of Finland and Mitsubishi Heavy Industries Ltd of Japan have signed a joint development agreement to design and develop new small, low-speed marine diesel engines of less than 450 mm cylinder bore.

The two companies see good business potential in pooling their resources and experience to develop new small marine engines of less than 450 mm cylinder bore. Such engines are suitable for a wide variety of small ship types, including bulk carriers, product tankers, chemical tankers, container feeder vessels and reefer ships. Such ships are employed in world-wide trades but with the smaller types being specifically employed in short-sea and coastal services. The new engines will meet the market needs for high efficiency, high reliability, compactness and environmental friendliness.

Details of the new engines to be developed under this agreement will be announced in a few months time after the initial design studies have been completed.

This agreement is an extension of the strategic alliance created by Wärtsilä and Mitsubishi in September 2005. This alliance was formed on the basis of the successful joint development by the two companies of the Wärtsilä RT-flex50 and Mitsubishi UEC50LSE low-speed engine types.

Wärtsilä has its own range of low-speed marine diesel engines covering the power range from 5650 kW to 84 420 kW. Today the Wärtsilä RT-flex engine types feature the latest electronically-controlled common-rail technology. Mitsubishi has its own range of UE low-speed marine diesel engines covering the power range from 1120 kW to 46 800 kW. Mitsubishi also has long co-operated in the manufacture of Sulzer and Wärtsilä low-speed engines going back to an agreement signed with Sulzer in 1925. The new, smaller engine types will reinforce the respective engine portfolios in the lower power range.

Order for Wärtsilä-Hyundai Joint Venture

Wärtsilä-Hyundai Engine Company Ltd, the new joint venture between Wärtsilä and Hyundai Heavy Industries in South Korea, received a major order in August. The order is for a total of 16 Wärtsilä 50DF engines for four ships to be built by Samsung Heavy Industries. The contract also includes an option of four more engines for a fifth vessel. The order is recorded in the order book of Wärtsilä-Hyundai Engine Company Ltd.

The engines are to be installed on Floating Production Storage Offloading (FPSO) vessels ordered by FLEX LNG. The first engine will be delivered in February 2010.

The Wärtsilä 50DF dual-fuel engine represents a pioneering industry change from traditional steam turbine machinery to a dual-fuel-electric concept with the benefits of much better operating economy and lower exhaust emissions. The engine can run on either natural gas, marine diesel oil or on heavy fuel oil. Furthermore, the engine can smoothly switch between fuels during engine operation and is designed to give the same output regardless of the fuel used.

Wärtsilä Corporation and Hyundai Heavy Industries Co. Ltd established the 50/50-owned South Korean joint venture, Wärtsilä-Hyundai Engine Company Ltd, in January 2007. The joint-venture manufactures Wärtsilä 50DF dual-fuel engines for LNG (liquefied natural gas) carriers and other marine applications. The 25 000 m^2 manufacturing facility, which has a production volume of approximately 120 engines per year, is located in the Deabul Industrial Complex in South Korea. Production began in July, 2008.

Wärtsilä-Hyundai Engine Company has been certified to the ISO 9001 Quality Management System standard. The certificate was issued on 28 July 2008 by the Netherlands-based accreditation authority, DNV certification BV.

The main markets for the dual fuel engines are in South Korea, which currently has a market share exceeding 80 percent of the LNG shipbuilding market.

Wärtsilä acquires German Ship Automation Company

Wärtsilä has acquired the German company Claus D. Christophel Mess- und Regeltechnik GmbH (CDC), which specializes in the design, delivery and service of automation systems for ship owners and yards. The company is based in Hamburg and has three business areas, which are maritime information technology, project engineering and customer service.

"CDC has an excellent proven track record, solid references, and an outstanding reputation among its customers. The company's operations will contribute to a significant increase in Wärtsilä's automation and electrical engineering competence and fits, therefore, Wärtsilä automation services' strategy well," says Tage Blomberg, Group Vice President, Wärtsilä Services.

"In addition, the highly-skilled and specialised service personnel of CDC will give valuable support to Wärtsilä's service categories", Blomberg continues.

CDC's net annual sales were €2.1 million in 2007. The company employs 12 people, all of whom have a high degree of competence in electrical engineering.

CDC's operations will be integrated into Wärtsilä Services and all employees will continue as Wärtsilä employees. The company's founder and former owner, Mr Claus D. Christophel, will continue working for Wärtsilä.

The Australian Division Council

The Australian Division Council met on Wednesday 25 June 2008 and this meeting, as usual, was conducted as a teleconference from the offices of the Australian Maritime Safety Authority, North Sydney. The President, Dr Stuart Cannon, welcomed Mr Jim Black and Mr Ian Laverock to the Council of the Division.

Some of the matters discussed included:

Basic Dry Dock Training Course

This course will be conducted shortly, in Melbourne, with interest from many members. The venue will be made available by Tenix.

150th Anniversary of RINA

Dr Cannon reported that the Committee established by the RINA Council to advise on the form and details for the anniversary had produced a document outlining options which might be developed. Members of the Australian Division Council were encouraged to provide suggestions to our President for consideration by the Committee.

The Newly-formed South Australia and Northern Territory Section

It was reported a meeting of interested members had been held and a Section Committee had been formed and had, already, established aims for the Section. The aims included encouragement of naval architects to join RINA and to continue joint Technical Meetings with kindred bodies.

Commission of Inquiry into the Loss of HMAS *Sydney II*

The Commission had invited the Australian Division to assist DSTO with the extensive studies to be undertaken by it in response to instructions by the Commission. The invitation has been accepted by the Division and the work is subject to a Confidentiality and Fidelity Agreement signed on 22 June 2008.

The Acceptance of Publication in RINA Journals by Academic Institutions

Council's attention had been brought to the apparent non-acceptance of publications in RINA journals when assessing their importance particularly in academic institutions. The importance of strict scrutiny of all papers in RINA publications was stressed and as this matter was of extreme importance to the profession, the matter will b e raised with RINA Headquarters.

The next meeting of the Council of the Australian Division will be held on Wednesday 24 September 2008.

Keith Adams
Secretary

RINA Council and Committee Members

To keep members up-to-date with who is doing the hard yards on their behalf in Australia, current council, section and committee members are as follows:

Australian Division

President	Stuart Cannon
Vice-president	Peter Crosby
Secretary	Keith Adams
Treasurer	Allan Soars

Members appointed by Sections
- Roger Best (WA)
- Craig Boulton (NSW)
- Samantha Tait (Vic)
- Chris Hutchings (Qld)
- Ian Laverock (ACT)
- Ruben Spyker (SA and NT)
- Giles Thomas (Tas)

Members elected or appointed by Council
- Jim Black
- Werner Bundschuh
- Peter Crosby
- John Jeremy
- Tim Lyon
- Martin Renilson
- Graham Taylor

Executive Committee
- President
- Secretary
- Treasurer
- Roger Best (representing members appointed by Sections)
- John Jeremy (representing members elected or appointed by Council)

ACT Section

Chair	John Colquhoun
Deputy Chair	Peter Hayes
Secretary	Glen Seeley
Treasurer	Tim Lyon
Members	Joe Cole
	Dan Curtis
	Lindsay Emmett
	Robin Gehling
	Kerry Johnson
	Ian Laverock

NSW Section

Chair	Graham Taylor
Deputy Chair	Craig Hughes
Secretary	Lina Diaz
Treasurer	Adrian Broadbent
Members	Craig Boulton
	Stuart Friezer
	Phil Helmore
	Rozetta Payne

Queensland Section

Chair	James Stephen
Deputy Chair	Mark Devereaux
Secretary	Vacant
Treasurer	Vacant
Members	Tommy Ericson
	Doug Matchett
	Marc Richards
	Tom Ryan

South Australia and Northern Territory Section

Chair	Ruben Spyker
Deputy Chair	Graham Watson
Secretary	Peter Crosby
Treasurer	Peter Crosby

Members	Neil Cormack
	Adam Podlezanski
	Sam Baghurst

Tasmanian Section

Chair	Stuart McDonnell
Secretary	Gregor Macfarlane
Treasurer	Jonathan Duffy
Members	Guy Anderson
	Alan Muir
	Giles Thomas

Victorian Section

Chair	Samantha Tait
Secretary	Edward Dawson
Treasurer	Tristan Andrewartha
Members	Goran Dubljevic
	Stuart Cannon
	Craig Gardiner
	Sean Johnson
	Lance Marshall
	Brett Morris
	Allan Taylor

Western Australian Section

Chair	Jim Black
Deputy Chair	Kristofer Rettke
Secretary	Max van Someren
Treasurer	Jim Black
Member	Tiju Augustine
	Roger Best

The Australian Naval Architect

Editor-in-Chief	John Jeremy
Technical Editor	Phil Helmore
Referee	Noel Riley

Safety Group

Chair	Graham Taylor
Members	Adrian Mnew
	Andrew Tuite
	Mike Seward

Walter Atkinson Award Committee

In recess

RINA London

Council Members	Stuart Cannon (*ex officio*)
	John Jeremy
	Martin Renilson
Safety Committee	Robin Gehling
High-speed Vessels	Tony Armstrong

RINA/Engineers Australia Joint Board of Naval Architecture

Chair	Robin Gehling
Member	Stuart Cannon

Marine Safety Victoria Marine Industry Advisory Group

Members	Martin Jaggs
	Adrian Mnew

National Marine Safety Committee Reference Group on Stability

Chair	Graham Taylor
Member	Bruce McRae

National Marine Safety Committee Technical Advisory Panel

Members	Tony Armstrong, WA
	Lindsay Emmett, ACT
	Rob Gehling, ACT
	Don Gillies, NSW
	Brian Hutchison, Qld
	Kim Klaka, WA
	Martin Renilson, Tas
	Prasanta Sahoo, Tas
	Graham Taylor, NSW

National Professional Engineers Register Naval Architecture Competency Panel

In recess

Pacific 2010 Organising Committee

Chair	John Jeremy
Members	Keith Adams
	Tauhid Rahman

Standards Australia Committee
AS1799 Small Pleasure Boats Review

Members	Tommy Ericson
	Steven McCoombe

Standards Australia Committee
CS051 Yachting Harnesses and Lines

Member	Bruce McRae

Phil Helmore

Award for Laurie Prandolini

Congratulations to Laurie Prandolini MRINA on his award of the Medal of the Order of Australia in the Queen's Birthday Honours. He was honoured for service to marine engineering, particularly through executive roles in professional organisations.

Laurie has been Secretary of the Sydney Branch of the Institute of Marine Engineering, Science and Technology for many years and has been deeply involved in the conduct of joint meetings and conferences with RINA, including the Pacific series of International Maritime Conferences, for over thirty years.

Laurie Prandolini OAM
(Photo John Jeremy)

NAVAL ARCHITECTS ON THE MOVE

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

Ryan Ayres, a student in naval architecture at the University of New South Wales, has taken up a part-time position as a naval architect with Incat Crowther Designs in Sydney while he completes the requirements for his degree.

Tommy Ericson has moved on from Brisbane Ship Construction and has taken up a position as Senior Naval Architect with Policy Implementation and Support in the Safety Standards Branch of Maritime Safety Queensland in Brisbane.

Hasan Farazi has moved on within Det Norske Veritas, and has moved as a Senior Surveyor from the Singapore office to the Sydney office.

Nazmul Hossain, a student in naval architecture at the University of New South Wales, has moved on in the ClassNK organisation and has taken up the position of Senior Surveyor while he completes the requirements for his degree.

Chris Hutchison has moved on from Commercial Marine Solutions and has taken up a position as Research Engineer with the Australian Maritime College in Launceston.

Jun Ikeda has moved on from Schlumberger Oilfield Australia and has taken up a position as a graduate engineer with Clough in Perth, in their Marine Construction and Fabrication Section.

Joanna Mycroft has moved on from SeaTec in Glasgow and has taken up a position as a naval architect with Rogers Yacht Design in Lymington, UK (south-west of Southampton and facing the Isle of Wight across the Solent). RYD designs a variety of yachts, mostly one-offs but also some production craft. She has been doing some rowing herself, but mostly coaching the University of Strathclyde girls eight, and they managed never to come last, and scored a first place at the Clydesdale regatta!

Dugald Peacock moved on from the IT Division of NRMA many moons ago and took up a position with the TAB, programming for their offices in Australia and South-east Asia, which he has completed and is now seeking positions requiring naval architecture/programming/IT expertise.

Adam Podlezanski has moved on from Thales Australia and has taken up a position as a Senior Naval Architect in the Submarine Structures Group at ASC in Adelaide.

Dave Sherwood has moved on from Austal Image and has taken up a position with Thornycroft Maritime and Associates (Aust) Pty Ltd in Fremantle.

Michael Smith has moved on within Lloyd's Register, transferring from the Yokohama Port office to the Sydney Port Office. Michael is a graduate of Southampton University and has worked with Lloyd's Register since 1993 in Rotterdam, London, France, Korea and various ports in Japan.

Hiro Sunayama has moved on within Austal, and has moved as a naval architect from Austal Image to Austal Ships in Fremantle.

Joon Chee Yew, a graduand of the University of New South Wales has been working as a naval architect for Jurong Shipyard in Singapore, who have been focussing on rig building, and he has been involved in jack-up and semi-submersible rig construction.

This column is intended to keep everyone (and, in particular, the friends you only see occasionally) updated on where you have moved to. It consequently relies on input from everyone. Please advise the editors when you up-anchor and move on to bigger, better or brighter things, or if you know of a move anyone else has made in the last three months. It would also help if you would advise Keith Adams when your mailing address changes to reduce the number of copies of *The Australian Naval Architect* emulating boomerangs.

Phil Helmore

HMAS *Anzac* approaching HMAS *Success* for replenishment at sea during exercise RIMPAC 2008 off Hawaii during July (RAN Photograph)

FROM THE ARCHIVES

SCRAP IRON

The RAN's new air-warfare destroyers will be powerful warships far removed in capability from Australia's first destroyers — the torpedo boat destroyers *Warrego*, *Huon*, *Swan* and *Torrens* which were completed between 1910 and 1916. The term 'destroyer' dates from the early 1890s, when small fast warships were developed to counter the threat to the battle fleet from torpedo boats — hence the name 'torpedo boat destroyer'. Whilst the role of the TBD changed during World War I and the type became a more general-purpose and anti-submarine ship, the title was not dropped until 1925 when they became simply 'destroyers'.

Perhaps the most famous destroyers to serve in the Royal Australian Navy were the 'Scrap Iron Flotilla' which earned this description from comments by Hitler's propaganda minister, Goebbels, when they arrived for service in the Mediterranean in the early part of World War II.

Australia's destroyers in the late 1920s were outdated, poorly armed and had limited endurance. Following Australian requests, the Admiralty agreed in 1933 to transfer more-modern ships on loan from the many held in reserve after the end of the war. The ships, *Stuart*, *Vampire*, *Vendetta*, *Voyager* and *Waterhen* arrived in Australia at the end of 1933. They represented the peak of British destroyer development during World War I and four were members of the famous V&W class — ships with a displacement of about 1470 tons full load and a speed of about 34 kn. HMAS *Stuart* was larger, being one of eight Admiralty-type flotilla leaders of about 2000 tons full load displacement and speed 36 kn, completed in 1918–1919.

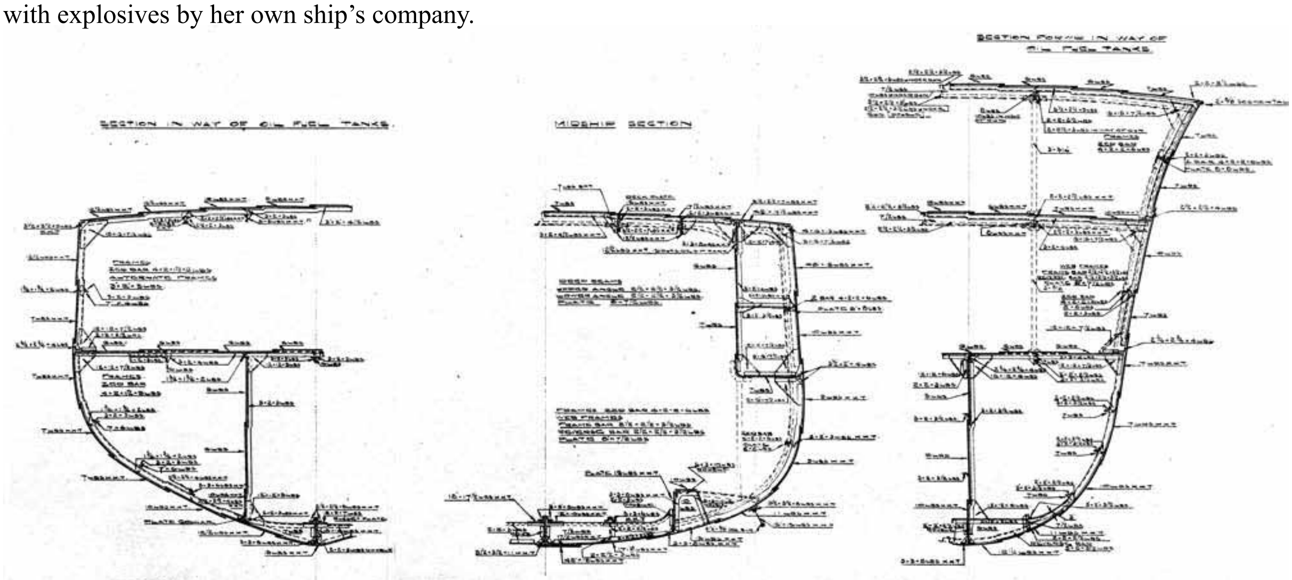
In May 1940, the ships became the 10th destroyer flotilla under the command of Commander Hector Waller in *Stuart*. The ships played a very active part in the Mediterranean war. HMAS *Waterhen* was the first to be lost, sunk by German dive bombers on 30 June 1941. The surviving ships returned to Australia in late 1941 and were soon in action again after Japan entered the war. *Vampire* survived the Japanese air attack when HMS *Repulse* and HMS *Prince of Wales* were sunk on 10 December 1941, only to be sunk herself in the Bay of Bengal with HMS *Hermes* on 9 April 1942. *Voyager* survived a little longer. She grounded on a reef off the coast of Timor while landing commandos on 23 September 1942. Heavily damaged by Japanese aircraft, she was destroyed with explosives by her own ship's company.

HMAS *Stuart* and HMAS *Vendetta* survived the war. *Vendetta* was in refit in Singapore in December 1941 and was towed to Australia and safety, finally reaching Melbourne in April 1942. After completing her refit she had an active war, mainly in New Guinea waters. She was paid off in Sydney on 27 November 1945 and subsequently sold for scrap. Her stripped hull was sunk off Sydney on 1 July 1948.

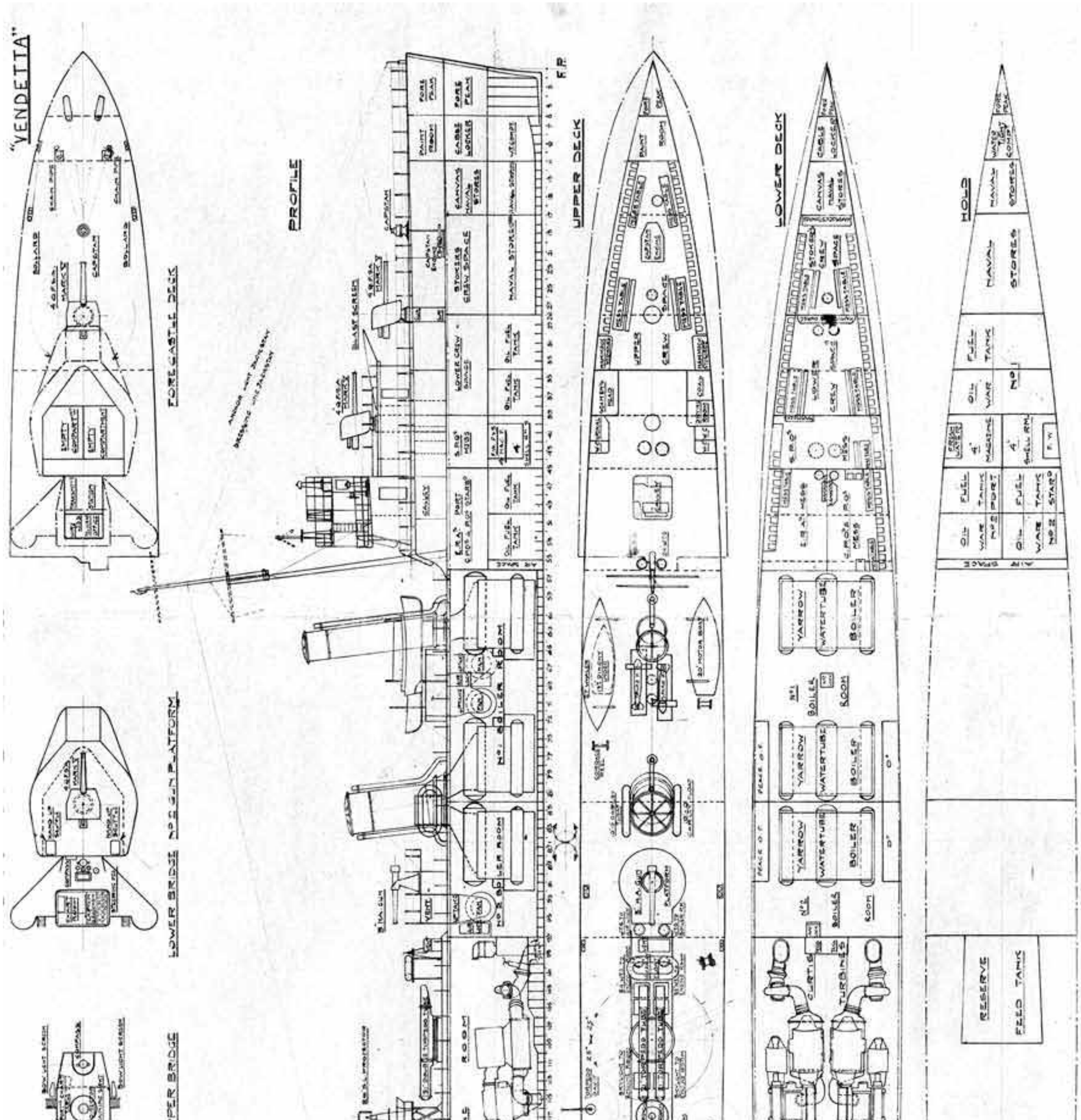
The V&W destroyers established a pattern for British destroyer design as it developed in the 1920s and 1930s. World War II provided further impetus for design improvement and the long line of British 'torpedo boat' destroyers reached it peak with the Daring-class design developed at the end of the war.

Today's destroyers inherit a type name with a long and glorious history, yet as warships their capability has far outstripped their earlier namesakes. They are, perhaps, more like successors to the cruisers of World War II.

HMAS *Vendetta* in the 1930s
(John Jeremy Collection)



Structural sections of HMAS *Vendetta*
(John Jeremy Collection)



The general arrangement of HMS *Vendetta* as she was at the end of World War I. HMS *Vendetta* participated in the Baltic Campaign of 1918–1920, capturing a considerable quantity of jewellery and silver from the Soviet destroyer *Spartak* on Boxing Day 1918 and adopted that ship's bell as her own
(John Jeremy Collection)

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