



Australian Maritime College Hydrodynamics Research Centre

ANNUAL REPORT 2003-2004

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SUMMARY

The Australian Maritime Hydrodynamics Research Centre (AMHRC) is a collaborative research organisation, established in 2001 as part of the Commonwealth Government's Major National Research Facilities Program by the Australian Maritime College, the Defence Science and Technology Organisation of the Department of Defence and the University of Tasmania. The Centre aims to provide an internationally-competitive experimental and theoretical hydrodynamic research capability for Australia. This financial year has seen the Centre developing significant research collaborations, finalising its organisational structure, achieving major performance milestones and progressing continually on facility access, research outputs and promotion. In this financial year, the Centre completed its Board membership and constituted an Advisory Committee. It also commenced its staff recruitment. The Centre has met or exceeded the milestones outlined in the Deed of Agreement for Towing Tank, Integrated Marine Simulator, Circulating Water Channel and High

Performance Computer. The upgrade of the Cavitation Tunnel is expected to lead to a world-class facility for experimental hydrodynamics. However, a delay of up to twelve months is expected due to materials cost increase, necessity of site relocation and technology update. A significant cost overrun has been foreshadowed. The Centre has achieved all the performance indicators except for the milestones for the Cavitation Tunnel and for Research and Other Grants target. Access to the facilities has increased over the targeted days. There is a significant improvement in the area of research collaboration, linkage with industry and research outputs. New collaborations with industry and research institutions have been established. The Centre worked with the AMC and AMC Search in promoting the facilities and its enhanced capabilities. It also developed its promotion colour brochure, its home Website, a Marketing Plan and a Commercialisation Plan. It is expected that the Centre will continue to progress in year 04-05 as per the Business Plan.



Experiment on the verification of sea swell modelling in the Model Test Basin

1 Introduction

This is the second annual report from the Australian Maritime Hydrodynamics Research Centre (AMHRC) to the Commonwealth Department of Education, Science and Training, in fulfilment of the requirement made in the Deed of Agreement for the Major National Research Facility Program.

The FY 03-04 has seen the Centre commence its actual and physical upgrade work on all facilities except for the Circulating Water Channel (CWC), completion of its High Performance Computer set-up, including software installation, and recruitment of staff as outlined in the Business Plan.

The Centre has developed strategies for enhancing research activities and improving its research capabilities in hydrodynamics related disciplines, while focusing on upgrading the facilities located at the Australian Maritime College.

The Centre has attempted to market itself to industry, defence and research communities in Australia. It has also developed a Website and colour brochure to promote its facilities and research capabilities. New collaborations with industry and research institutions have been established.

The Centre constituted its Advisory Committee in July 03, and this Committee has held regular meetings to advise the Centre on a range of issues including marketing and strategic planning.

Research activities of the Centre are carried out by researchers from the three Participants (AMC, DSTO and UTAS), either individually or in teams, and in collaboration with internal and external researchers.

The Centre's performance has been assessed using the Performance Indicator Survey agreed by the Commonwealth prior to FY 02-03. The rationale underpinning the development of the Centre is that incremental and measurable progress should be made over the five years of its life, in order to realise its vision, achieve the outcomes outlined in its Business Plan, and meet the objectives of the MNRF as decreed by the Commonwealth.

2 Progress With Establishment

The Centre has completed its governance structure by (1) forming an Advisory Committee, and (2) appointing an additional Board member to represent industry users of the Centre.

In October 03, Mr Robert Dunbar, General Manager for Australian Marine Technologies Pty Ltd, based in Williamstown, Victoria joined the Board. Mr Dunbar brings a wealth of experience in marine technologies, the Australian



shipping industry, and business management. Mr Dunbar represents the end users of the Centre.

In October 03, the Advisory Committee was constituted. In sourcing its membership, the Centre and its Board ensured that all considerations be made to acquire the expertise and experience needed to provide the Centre Manager with advice for the Centre's operation and long-term sustainability.

To realise its vision, the Centre is set to establish a stronger theoretical and computational capability to complement the well-established experimental capabilities, enable the Centre to engage in crucial international collaborations, and meet the needs of Australian Defence and industry.

The Centre recruited a graduate engineer to assist with the upgrade of the Towing Tank. The Centre also recruited a part-time Personal Assistant for the Centre Manager.

To strengthen its strategic position, the Centre decided to recruit (1) a research position in the area of Computational Fluid Dynamics in order to complement the experimental work derived primarily from the Cavitation Tunnel, and to assist collaborations with international research organisations; and (2) a Hydrodynamic Simulation Researcher to enhance research in the maritime simulation area and meet the upgrade milestones of the IMS.

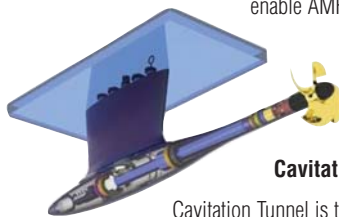
To encourage research activity in the hydrodynamics field, the Centre has established a research award titled "AMHRC Hydrodynamics Research Award".

Assisted and guided by its Advisory Committee, the Centre has developed a Marketing Plan to guide the Centre's promotion and marketing activities, and assist in the identification of opportunities for the Centre for the coming years. It acknowledges 'research business' as the core business of the Centre, for which opportunities will be identified.

High Performance Computer - the Centre installed a suite of CFD software on the HPC. Called Newt System Software, it is a product of Cambridge Flow Solutions Ltd (a subsidiary of Cambridge University). This software will enable AMHRC researchers to conduct CFD modelling such as

propeller design, using the latest CFD technologies. It also provides a platform for international collaboration beginning with researchers at Cambridge University.

Cavitation Tunnel - Of the facilities being upgraded, the Cavitation Tunnel is the largest and most technologically demanding; the upgrade utilising leading-edge technologies developed in Europe and the US in naval, aerospace and nuclear industries. Once completed, the Tunnel is expected to be a world-class experimental hydrodynamic research facility for Australia. Its



flagship reputation has been affirmed by high quality research work and highly significant defence associated projects in FY03-04.

The main tasks undertaken on the design and manufacture of the CT have included:

- (1) Near completion of the tunnel circuit design.
- (2) Design and purchase of ancillary systems.
- (3) Design of tunnel building and site-work preparation.
- (4) Co-ordination of the tender process for the tunnel building.
- (5) Manufacture of diffusers and degassing and nuclei injections systems.
- (6) Near completion of R&D associated with circuit design.

Notwithstanding the delays and challenges, ongoing R&D activities have continued to be undertaken with the Centre Participants in addition to external collaborators.

Extensive and necessary building modifications, significant building cost increases and substantial re-design of tunnel components for cost reduction have all contributed to the delay for the tunnel upgrade. A current conservative estimate of the CT upgrade has indicated a significant cost overrun. The Centre has been in consultation with the Participants to address this financial issue.

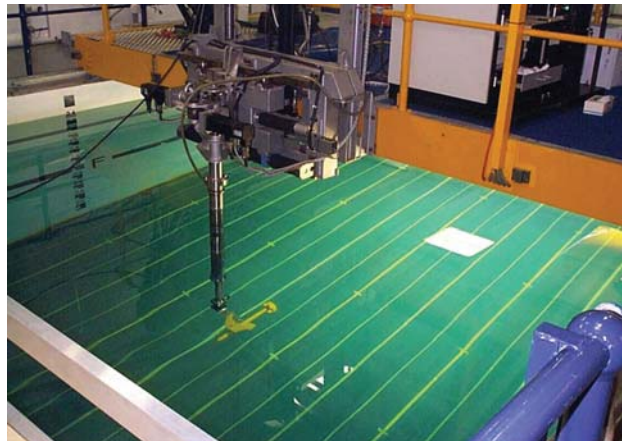
Based on the design and building tender information to date, the Centre has rescheduled the milestones for the CT upgrade. The upgrade will be scheduled to complete by 2005.

Towing Tank - The preliminary design for the extension of the towing tank and related civil engineering work have been completed on schedule. Detailed engineering design is approximately 90% complete and the tender document for the tank extension and related civil work is being prepared and should be ready by end of August 04. The tender process can begin soon after.

Integrated Marine Simulator (IMS) - The design of the prototype visual system has been completed. A new Silicon Graphics computer has been ordered as the new sub-system for the prototype visual system. Rheinmettal Defence Electronics, the current supplier supporting IMS software, has agreed to supply the source code for the IMS visualisation upgrade.

Preliminary investigations for developing a Tug Simulation Laboratory were undertaken to assess the feasibility.

Another activity of the IMS upgrade is the enhancement of software used to model ship motions, and to simulate sea state, swell, ship squat, and ship-to-ship interaction. An international collaboration involving Associate Professor Sera Wataru (from Kobe University, Japan) and AMC researchers has laid the



foundation for this activity. Work completed thus far includes mathematical algorithms for sea swell, and preliminary experimental verification. The photograph on the cover shows an experiment being conducted in the Model Test Basin.

Circulating Water Channel (CWC) - Investigation has been carried out on the enhanced data acquisition capability and modified control system for the CWC. The

concept design plan for this system has been developed and a working design prototype version for the observation windows has been built.

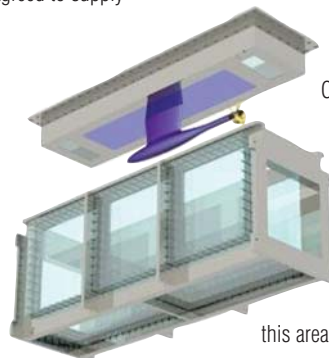
3 Research, Access and Collaboration

AMHRC access to facilities includes time allocated to the following activities: (1) Facility upgrades; (2) Research, and training activities undertaken by the Participants; (3) Use by collaborators; and (4) Commercial use.

Table 2 shows the actual number of days access provided to the AMHRC in 03-04 versus the planned number. The significantly large number of days access for the CT, TT and IMS is due to the volume of work involved in the facilities upgrade and provision for undergraduate teaching. The charge for commercial use is in accordance with the Business Plan.

Table 2 AMHRC access in 03-04

AMHRC Access (Days/year)		
Facility	03-04 planned	03-04 actual
Cavitation Tunnel	60	234
Towing Tank	40	167
Model Test Basin	70	69
CWC	20	36
IMS	20	127



A significant development in research collaboration is the Memorandum of Understanding between the University of Cambridge, University of Tasmania and the Australian Maritime College. The purpose of this MoU is formally to state the mutual interest of the AMC, UTAS, and UCAM in industrial fluid mechanics research related to aerodynamics, hydrodynamics, marine applications and their intent to collaborate for the purpose of advancing understanding in this area through the sharing of infrastructure and intellectual property

and acquisition of joint research grants. The installation of the Cambridge Flow Solutions' CFD software (NEWT) on the Centre's High Performance Computer is a first step of this collaboration.

A separate MoU between AMC and Curtin University has been signed which focuses on AMHRC projects.

Both AMC and UTAS have joined in TREN (the Tasmanian Research and Education Network) which is to deliver high-speed broadband capability between Tasmania and the Mainland for research and education purposes. This has potential benefit for AMHRC to engage with mainland universities and other institutions on joint research projects requiring high speed data transfer. A concept of remote access to the experimental hydrodynamic facilities at AMC is being pursued with Curtin University.

Researchers from all three Participants have maintained their active pursuit in Cavitation and Fluid Dynamics and Ship Hydrodynamics and formed new collaborations with domestic and international institutions, including Cambridge University, Curtin University and Department of Defence. Most of the collaborative activities listed are based on initiatives of individual researchers from the Participants.

AMC and UTAS have formed a strategic research collaboration arrangement with the Department of Engineering, Cambridge University, to pursue the advancement of understanding in industrial fluid mechanics research related to aerodynamics, hydrodynamics and marine applications. The collaboration will also facilitate the sharing of infrastructure and intellectual property, and the acquisition of joint research grants. This agreement is built upon the experimental research strength of AMC and UTAS, and the computational strength of the Cambridge University.

The projects involving industry participants (those with Crowther, Surf Hardware International, Elms Australia, Farr Yacht Design, and Virtual Sailing Pty Ltd) are funded by those participants.

Researchers from the three Participants published their findings on prominent international journals and conferences such as International Journal of Maritime Engineering, International Conference on Offshore Mechanics and Arctic Engineering.

4 Promotion of the Facility

The AMHRC continues to use AMC's commercial arm, AMC Search Ltd, to market the Centre's facilities through its client database and regular seminars. Assisted by the Advisory Committee, the Centre has developed a strategic Marketing Plan. This Plan focuses on 'research business' of the Centre and aims to create self-sustainability for the Centre in the long term. As a part of the marketing drive, the Centre has developed an eight-paged colour brochure.

The Centre also undertook a number of 'outreach activities'. They include display booth of an international conference, presentations made to



conference, workshops and targeted industry client groups.

The Centre developed and launched its own Website at: www.amhrc.edu.au.

5 Commercialisation

The Centre has focused primarily on the facility upgrade and staff recruitment. The Centre has developed a Commercialisation Plan which identifies the strengths, weakness, threats and opportunities for the Centre.

MNRF funding and resources from AMC, DSTO and UTAS provide the Centre with the means to develop enhanced facility capabilities, which will strengthen the R&D capability of Australia in hydrodynamics related areas, and intellectual capital in general. The completion of the facility upgrade and the research activities arising from this, should provide a variety of commercially viable results on which the Centre will capitalise.

In its pursuit of commercialisation, the Centre has focused on "research business" in accordance with the AMHRC Deed of Agreement. It will concentrate primarily on industry R&D projects and competitive research funding to develop its research capability, foster technology transfer and support the Commonwealth Department of Defence. Success in this area will also enhance the contribution to teaching, learning and training in maritime engineering. Provision of upgraded facilities for teaching and learning through the AMC is also an essential part of the commercialisation.

6 Financial Reporting

The planned cash budget for the Centre in this FY is \$1.13m. This includes the Commonwealth MNRF Funding for 03-04 of \$955,000 and cash contribution from the AMC of \$100,000. The actual expenditure for 03-04 amounts to \$609k and the commitments are \$233k. A balance of \$249k will be carried over to FY 04-05 for facility upgrade.

The approved total inkind budget for the Centre this FY amounts to \$1.4m equivalent. The actual inkind contributions from the Participants accrued to \$1.m equivalent. The difference is mainly attributed to more than expected activities on the CT upgrade.

In FY 04-05, the Centre's planned budget will be \$1.49m cash and \$1.5m inkind.

The End

