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The Second International Conference on

HIGH SPEED MARINE VESSELS

2 - 3 MARCH 2011

FREMANTLE, AUSTRALIA

day 1

08.30 - 09.00 **COFFEE AND REGISTRATION**

09.00 - 09.35 **ON THE ENVIRONMENTAL IMPACT OF HIGH-SPEED AND LIGHTWEIGHT CRAFT**
Tony Armstrong, Austal, Australia

High speed can be achieved by high powered engines, but the successful operation of a high-speed craft is dependent on the ability to design a lightweight craft with medium power levels and the optimisation of the hull for best performance as well as optimisation of the operation and management of the craft. Exhaust emissions from ships, particularly CO2 emissions, are coming under very close scrutiny from IMO and other Organisations and efficiency indices are being proposed indicating the comparative performance of certain ship types.

09.35 - 10.10 **RECENT DNV DEVELOPMENT FOR HIGH SPEED CRAFT**
Rodney Humphrey, DNV, Australia

The safety of high speed passenger and cargo craft on international voyages is addressed by the IMO HSC Code. For many domestic markets then high speed craft have increasingly been used for a diverse range of applications such as crew transfer, patrol, service vessels etc for which the HSC Code is not directly applicable. In this paper DNV discusses the difficulties currently experienced in some market segments and then the steps which DNV have taken for practical and pragmatic requirements to be introduced in the DNV Rules. The result is the provision of appropriate safety levels for high speed craft operating outside the scope of the HSC Code.

10.10 - 10.45 **THE APPLICATION OF LNG AS A FUEL FOR ALUMINIUM MEDIUM AND HIGH SPEED FERRIES**
James Bennett, Austal, Australia

Fuel oil pricing and the potential for a carbon trading schemes will in the near future place additional financial challenges on the way that ferries are operated. Austal has been investigating the application of LNG as a fuel for several ferry types, including medium speed and high speed Ro/pax vessels. This paper outlines the vessel types that have been investigated and presents the challenges, and the potential outcomes, performance and benefits that can be delivered from each ferry type.

10.45 - 11.15 **COFFEE**

11.15 - 11.50 **A REVOLUTIONARY RIDE CONTROL SYSTEM FOR MULTI-HULL HIGH SPEED MARINE VESSELS**
Alexander Robertson, Nauti-craft Pty Ltd, Australia

This paper presents a fundamental change in the way marine vessels can be designed so that they can be driven safely and comfortably at high speed. This new approach isolates the hulls from the super structure using a sophisticated suspension system with automotive heritage. The shape and design of the hulls provides the first response to inputs from the surface, similar to the tyres on a wheel and the suspension system provides the second response. The system proposed is a passive, reactive system and is overwhelmingly driven by the inputs received by each of the hulls.

11.50 - 12.25 **TRANSVERSAL DYNAMIC STABILITY OF LEISURE CRAFT IN A SAFETY PERSPECTIVE FOR A PRELIMINARY DESIGN PHASE**
P. Gualeni and M.Viviani, Department of Naval Architecture and Electrical Engineering, Genoa, Italy
D.Ruscelli, Cetena SpA, Hydrodynamics Dept., Genoa, Italy

This paper has the objective to study possible ways of investigation about the dynamic behaviour of high speed planing craft, with particular attention to transversal stability. From the methodological point of view, the way envisaged in order to account for the external wave induced disturbances and to capture the strong nonlinearities of high speed craft too, consists of a non-linear seakeeping code, developed in the time domain. To this aim the extension to coupled transversal motions (sway and yaw) of an existing code able at present to deal with coupled heave, pitch and roll is under development.

12.25 - 13.30 **LUNCH**

13.30 - 14.05 **HIGH SPEED RIDE CONTROL**
Endicott Fay, Cotty Fay Marine Design Inc, Australia

The paper develops a horizontal foil with twin vertical struts to provide ride control for vessels up to 200 feet in length running between 15 and 30 knots. The paper discusses the methods for calculating the added mass and damping coefficients for the combined hull and foil for yaw, sway, roll, heave and pitch. The discussion will include a quantitative look at the improved seakeeping response in roll, heave and pitch and maneuverability as well as the potential reduction in resistance. A pair of design examples will be presented to show the effects and general arrangement of the foil system including a large crewboat and pilot/patrol boat.

14.05 - 14.40 **THE DEVELOPMENT AND TESTING OF A NOVEL RIDE CONTROL SYSTEM FOR A 102-METRE TRIMARAN**
Mark Elphinstone, Jonathan Lee & Tony Armstrong, Austal, Australia

The trimaran hull shape and layout are deliberately designed to work in conjunction with underwater foils in order to maximise passenger and crew comfort, and for the design of the next generation of high-speed trimaran it was decided to develop a novel ride control system specifically to suit the characteristics of trimaran motions, which were found to be generally longer and slower than catamarans. Various systems and controlling software were analysed in a numerical simulator, and novel fully-articulated T-foils were developed to best suit the new design. These were designed and manufactured in-house at the same time as a 40-knot 102-metre length trimaran was being constructed. New controlling software was also developed to suit the long-period motions of the vessel.

14.40 - 15.10 **COFFEE**

15.10 - 15.45 **CONTROL OF HYDROELASTIC INSTABILITY OF HULL PANELS THROUGH STRUCTURAL INHOMOGENEITY**
B.H. Tan, A.D. Lucey & M.W. Pitman, Fluid Dynamics Research Group, Curtin University of Technology, Australia.

It is well-known that as a simply-supported flexible panel is exposed to increasingly high velocities then the panel will succumb to a divergence or static buckling-type instability at a particular critical flow speed. At a higher critical flow speed then the panel will experience violent oscillatory fluttering-type instabilities. To influence the critical speeds at which these instabilities occur to ensure stability, it is possible to thicken or strengthen such panels, however this generally attracts higher material costs and increases dead weight. A more elegant solution is to postpone instability onset through design that makes use of localised inhomogeneity such as added lumped mass, spring-supports, or notched panel designs.

15.45 - 16.20 **UTILISING AIR LUBRICATION FOR ENERGY EFFICIENT HIGH SPEED MARINE VEHICLES**
Serhan Gökçay, Türk Loydu, Turkey

Since there are many researches on optimisation of hull, propellers and superstructures, this paper focuses on air cavity concept which is one the most effective air lubrication method applicable for HSMV. As a promising numerical method, Computational Fluid Dynamics were utilised in order to investigate the key parameters of effective air cavity. A model of high speed craft with air cavity was selected. Available experimental data were used to validate the CFD model. Parameters such as air flow rate, cavity step height and form of cavity were investigated. Results in terms of resistance reduction, void fraction rates as well as pressure distribution were presented.

16.20 - 16.55 **130 M WAVE-PIERCER CATAMARAN: A NEW ENERGY-EFFICIENT MULTIHULL OPERATING AT CRITICAL SPEEDS**
Gary Davidson and Tim Roberts, Revolution Design, Australia
Stuart Friezer, Stuart Friezer Marine, Australia
Giles Thomas, Neil Bose and Michael Davis, University of Tasmania

This paper describes the development of a new 130 m wave-piercer catamaran which can operate with high deadweight at speeds close to hump (Fn=0.45) with high efficiency and manoeuvrability. This paper presents results from towing tank experiments into the resistance characteristics of the new 130m vessel and the issue of accurate powering extrapolation examined.

17.00 - 19.00 **VISIT TO AUSTAL'S YARD**
An oppotunity for delegates to tour the Austal Yard. Coach travel to and from Austal is arranged and included. Please inform us when registering if you would like to take part.

19.00 - **EVENING DINNER - KINDLY SPONSORED BY AUSTAL**

day 2

08.30 - 09.00 COFFEE AND REGISTRATION

09.00 - 09.35 STATE-OF-THE-ART VISCOUS CFD SIMULATIONS
Rodrigo Azcueta, Cape Horn Engineering S.L. Spain

This paper will present the application of state-of-the-art viscous CFD simulations to high performance marine vessels and demonstrate that simulations are a good alternative to physical models and tank testing. The simulations are based on the experience gathered over the last few years in the design of high performance racing sailing boats, especially for America's Cup and Volvo Ocean Race campaigns, the Formula One of the seas. CFD is one of the new technologies that can be successfully transferred from the racing environment to the wider industry, and especially the high performance marine industry can now profit from its achievements.

09.35 - 10.10 A STUDY OF THE LOSSES AND INTERACTIONS BETWEEN ONE OR MORE BOW THRUSTERS AND A CATAMARAN HULL
Tobias Clarke, Peter Ewing and Lee Boddy, Austal, Australia

High-speed catamarans are sometimes fitted with one or more retractable side thruster at the bow in order to assist with docking or slow-speed manoeuvring in high winds. It is apparent from operation of a catamaran fitted with these devices that the performance may be less than the nominal side thrust claimed by the manufacturer. CFD analysis was carried out to better understand the forces arising from the Coanda effect caused by the transverse flow of water under each hull, as well as the loss of thrust that could be expected from one side thruster operating in the wake of a similar thruster fitted in the opposite hull.

10.10 - 10.45 A 2D SMOOTHED PARTICLE HYDRODYNAMICS STRIP THEORY FOR CALCULATING SLAMMING LOADS ON HIGH SPEED CRAFT
D.J. Veen and T.P. Gourlay, Centre for Marine Science and Technology, Curtin University, Australia

A computational method is described for predicting slamming pressures and loads on the bow of a ship. Although the method can be used for any wave heading, we shall concentrate on the head sea condition. The method uses pre-calculated Smoothed Particle Hydrodynamics (SPH) simulations of slamming of each hull section over a full range of impact velocities. Standard seakeeping methods are used to determine relative impact velocities for a given hull shape, speed and sea conditions. The SPHsimulated slamming pressures as a function of time are then calculated for each hull section. For minor slamming, the slamming pressures can be calculated independently of the standard seakeeping analysis, whilst for major slamming the slamming loads can be fed back into a time-domain seakeeping analysis to see the resulting effect on motions.

10.45 - 11.15 COFFEE

11.15 - 11.50 BENEFITTING FROM NEW KAMEWA WATERJET DESIGNS
Reima Aartojärvi and Joakim Adamsson, Rolls-Royce Marine Australia

The improved cavitation characteristics of the new S3 pump unit allows smaller waterjets to be installed, usually a reduction of one or two frame sizes for equivalent performance. It futher leads to a positive design spiral for the vessel as a whole; lower waterjet weight and less engine power means reduced machinery weight, plus a lighter fuel load for a given range. The result is either a more economical vessel on a given route, or one with more performance for less installed power. This paper will quantify the improvments and focus on how the improved capability of the new Kamewa Water jet can best be utelised.

11.50 - 12.25 MATERIAL SELECTION AND GALVANIC PROTECTION OF WATERJET SYSTEMS
Rob Verbeek and Henk de Jong, Wärtsilä Netherlands

For efficiency most high speed craft are propelled by waterjets. For excellence in manoeuvring behavior waterjets are also increasingly used for low speed applications. For both types of application the selection of the material of the different components in the jet are of importance. This paper deals with the different criteria in the material selection of the waterjet. Properties such as strength, weight, fabrication method and cost are leading properties among others used in the selection of the material of the different components.

12.25 - 13.30 LUNCH

13.30 - 14.05 QUANTIFYING THE EFFECTS OF SMALL CRAFT HIGH SPEED TRANSITS ON PERSONNEL
Paul Elischer, Michelle Grech, Darren Sanford and Darren Wiese, Defence Science and Technology Organisation

This paper describes the approach and outcomes of a number of studies undertaken on small high speed craft (HSC) of the type used by commercial operators (thrill rides), water rescue organisations and the military. These transits place great physical demands on personnel due to wave impacts and continuous whole-body vibrations. Acceleration data was measured, during a number of studies, at various locations on the craft and at the lumbar region of the craft operators. This was supplemented by human factors data.

14.05 - 14.40 MOTION CONTROL OF RESONANCE-FREE SWATH USING SMALL MOVABLE FINS
Motoki Yoshida, Kyushu University, Japan

The speed reduction, additional resistance or slamming, which are caused by the large amplitude of ship motions, should be restricted completely for oceangoing large fast ships, because of the strict time-punctuality and the high value of the cargo. A "Resonance-Free SWATH (RFS)" as the oceangoing large fast ship has the negative restoring moments, which leads to resonance-free in the motion responses, because of the extraordinarily small water plane area. The RFS is designed to cross 4,800 nautical miles of Pacific Ocean in 5 days punctually at a high speed of 40 knots, with the good seaworthiness such as no speed reduction or absolutely no slamming even in the rough sea.

14.40 - 15.10 COFFEE

15.10 - 15.45 SEAACTIVE SUSPENDED FLOOR IN ROYAL MARINES ARTIC 28
Chris Broadbent, MSESI Group, Dstl Naval System

This paper will describe the trials by the Royal Navy of a new concept in ride attenuation for small craft. The Seaactive system has been developed under MoD Programmes & Technology Group innovation demonstrator programme funding. A copy of the Royal Marines Artic 28 Rigid Inflatable was build with an active suspended deck. This deck locates all the seats and consoles on a single platform mounted on an air suspensions system with electronically controlled “Formula One Technology” damper system. This is to address the attenuation of ride shock problem required under EU legislation and the duty of care to MoD personnel, using a Seactive suspended deck The report describes the trials on the system fitted and the modifications necessary to the basis vessel.

15.45 - 16.20 A TRIMARAN TRAILERSHIP FOR AMERICAN'S MARINE HIGHWAYS' EXPRESS SERVICE
Igor Mizine, CSC AMC

The paper describes the results of the design of an innovative High Speed Trimaran Trailership (HSTT) as part of the fleet of trailerships, capable of carrying about 160 53' trailers in the speed range of 25 to 30 knots. The HSTT design requirements are the result of market analysis supporting a daily service between the U.S. States of Massachusetts and Florida using a four ship fleet of express ships. This type of new express cargo ship could also provide military mobility capability in many inter and intra theater Sealift and Sea Base scenarios with range of unrefueled voyage of up to 9,500 nautical miles.

16.20 - 16.55 AIR SUPPORTED VESSEL (ASV) MONOHULL, RESULTS FROM FULL SCALE TESTING OF 20 M TEST VESSEL.
Ulf Stephen Tudem, Effect Ships International AS

In current paper ESI will present a 20 x 5,4 m fully instrumented ASV mono test-vessel, and the quite remarkable results achieved. The vessel is primarily designed for pleasure boats and yachts, and is fitted out with IPS pod propulsion from Volvo Penta. The patented hulls may also be adapted to different propulsions, pods or others in sizes from 15 m to 50 + m. Alongside discussions of the performance and capabilities of the ASV test vessels, also other ASV designs prepared for other applications, including patrol vessels, passenger ferries, crew-boats and various navy use will be presented. The new concept highlights environmental-, operational-, and ec onomical benefits achievable with the ASV technology.

International Conference
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2 - 3 MARCH 2011
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VENUE
The Venue for the conference is:

Fremantle Sailing Club, 151 Marine Terrace, Fremantle, WA 6160, Australia.

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