SURV 8

Surveillance, Search & Rescue Craft

The Royal Institution of Naval Architects

Lifeboats

Conference Programme

The 8th International Conference on Surveillance, Search and Rescue Vessels

WEDNESDAY 20th & THURSDAY 21st MARCH 2013
AT THE RNLI COLLEGE, POOLE, UK

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DAY 1 PAPERS INCLUDE:

TIME FOR A RETHINK ON RIBS

D. Pike, Dag Pike Associates, UK

RIBs are celebrating their 50th. Anniversary in 2013 and they have come a long way in that time. Today RIBs come in a huge variety of shapes, sizes and forms, all purporting to be RIBs but in reality only some have the characteristics of the RIB. The proposed paper would look at the original RIB concept and its virtues and ask why so many of the benefits of the original RIB designs have been lost or ignored in modern designs.

50 years ago when we developed the original RIBs with the RNLI we did a lot of trials to try and optimise the concept. These trials involved varying the tube location, tube pressures and tube attachment in relation to the rigid hull in order to optimise the design. The paper would look at these results and explain the virtues of the original RIB and why it was such a design advance in its time.

These beneficial parameters of the early RIB designs would then be compared with modern RIB designs, exploring the use of higher tube pressures, foam and hybrid tubes and tube position in relation to the rigid hull. It would explore these parameters in relation to wave impact and shock loadings and would further explore the possibility of a more holistic approach to RIB design and in particular to shock mitigation with the aim of restoring the benefits of RIB design to modern concepts.

U.S. COAST GUARD BOAT FORCES

D M Shepard ,USCG Office of Boat Forces, DC, USA

The U.S. Coast Guard operates approximately 1,700 boats that are used for a wide range of missions including Search and Rescue (SAR) and Ports, Waterways and Coastal Security (PWCS), Law Enforcement (LE) and Aids to Navigation (ATON) support. This paper will address some of the challenges in obtaining boats to meet these diverse mission needs and then describe in more detail some of the recent acquisitions. Included will be: an update on the 45 ft Response Boat – Medium (RB-M) that was presented during SURV 7; the 29 ft Response Boat – Small (RB-S) that is a multi-mission asset operating from Stations, the 32 ft Transportable Port Security Boat (TPSB) that is deployed for port security operations; and the 64 ft Special Purpose Craft – Screening Vessel (SPC-SV) that is used to escort high value ships.

SHIPS' RESCUE CRAFT: AN INVESTIGATION INTO THE CAUSES AND EFFECTS OF WEIGHT GROWTH

C Cain, R M Cripps, A White, Longitude Engineering, UK

In February 2011 during a routine trial, a 6.5m ship's Rescue Boat parted from its davit wire and fell 29 metres, causing a fatality. Following the accident, the Marine Accident Investigation Board found that the vessel was over 40% heavier than originally designed. This paper describes the subsequent investigation into the causes and effects of the identified weight growth. The full destructive testing of a representative Rescue Boat and the critical assessment of its structure is detailed. Practical SOLAS-based trials are also described hereby the effects of weight increase on the safe functionality of a representative craft are assessed. These trials have determined that the use of in-built buoyancy foam, in association with the wider design approaches to such craft, can lead to the possibility of water retention. The use of buoyancy foam is common place across the industry; however it is proposed that the associated concerns through life may not be obvious to key stakeholders. Despite the apparent technical simplicity of such craft, risks to the safety of the crew and the reputation of the vessel operator are still significant. Weight growth can lead to the significant erosion of lifting safety factors and can have catastrophic consequences if not managed correctly. This paper highlights the critical issues for buyers, designers, owners, operators and maintainers Rescue Boats, Fast Rescue Craft and Lifeboats.

"PROFESSIONAL" WATER CRAFT - THE P IN PWC? AN ANALYSIS!

David Lane, MD of Lane, Jefferies & Associates Ltd, UK

Personal Watercraft, speedy responsive performers, already used by recreational users and rescue services around the world e.g. the RNLI, but many other professionals are increasingly choosing Rescue Watercraft (RWCs) for their needs.

No surprises here, the clear functional performance qualities of 'RWCs' also select these high powered craft types for emergency response and patrol duties; with their modified-V hull, watertight compartment(s), jet pump propulsion, shallow draft and other design and constructional features being ideal for operational rescue – maritime shoreline with rescue boards or inland rivers or flood rescue by fire and rescue services, support roles and police or military patrol duties. Load carrying up to three people increases ranges of use.

Case studies of PWC use during the 2012 Olympics and Paralympic Games and by Netherlands MOD SFs will illustrate the examination of:

- Risk assessments
- Operational environment
- Navigation requirements
- Adaptations for patrol and interdiction work etc.
- Durability and equipment platform
- Fitness for purpose for Health and Safety legislation – no operations permitted without meeting exacting requirements
- Operations grounded on Training Needs Analysis with uniquely different crew competencies, operational practices and especially the training regimes for operational safely.

Presentation by a Fire and Marine Safety Consultant and Water Rescue Boat Training services provider – whose been internationally recognised by the prestigious Higgins and Langley Memorial Award medal for Outstanding Achievement in Swiftwater Rescue, for the role in helping develop the capability of the UK's Fire and Rescue Services for water rescue.

UK MOD APPROACH TO MANAGING WHOLE BODY SHOCK AND VIBRATION IN SMALL FAST CRAFT

M Hawkins, MoD, UK & R Finnemore RN (Rtd) NCS Ltd.

The introduction of UK Legislation to limit the exposure of Whole Body Vibration (WBV) to employees in their working environment created the potential to reduce the operational capability of the UK MoD when operating small fast craft. In the maritime environment the daily A(8) WBV exposure limit can be exceeded well within 2 hours when conducting certain mission profiles.

This paper will outline the approach that the MoD is taking to manage exposure in accordance with the law and reduce the risk of exposure to As Low As Reasonably Practicable (ALARP). The MoD is taking a multi-faceted approach addressing training, doctrine, culture, monitoring of exposure levels, health surveillance, plus introduction of equipment and technologies to reduce the risk of harm. This is a complex issue, made all the more so for the MoD because of the diverse range of military tasking undertaken; an annual user population of approx 5000 people (crew and passengers), utilising over a 1000 boats in 28 classes covering operations by the Royal Navy, Royal Marines, Royal Fleet Auxiliary, Army and MoD Police all of which have differing mission profiles and procedures. The MoD is working in association with the MCA, RNLI and HSE who sit as non-executive members on the MoD Maritime Whole Body Vibration Project Board. This paper will be of interest to any organisation which operates or designs small fast craft in the leisure, commercial, emergency, government and military sectors.

DESIGN DEVELOPMENT FOR 16.7M RESCUE/PATROL BOAT

A Nazarov, A Leeprasert, A Piamalung, P Suebyiw, W Wongkitrungrueng
Albatross Marine Design, Thailand

The paper presents case study and describes process of design development for 16.7m composite rescue/patrol boat for EMERCOM (Russia) developed by Albatross Marine Design. Design analysis and optimization is described based on parametric representation of planning craft; design envelope is studied in terms dimensions of craft, speed, range, acceleration levels, weights and costs. The craft is designed for railway transportation within imposed restrictions; these limitations are studied in relation to applicable requirements for intact and damaged stability and architecture of craft. Self-righting considerations are presented. Performance and seakeeping are reviewed based on results of calculations and sea trials of similar craft designed by AMD. Approaches in structural design and their effect on structural weight are studied with comparison of requirements imposed by different classification societies and standards. Special research is given to interpretations of requirements for such craft by Russian Register and implementation of these requirements into engineering practice reality. Construction technique is outlined and construction progress brief is presented.

CONSOLE AND DASHBOARD DESIGN FOR HYDROPLANING BOATS OPTIMIZING GEOMETRY FOR CONTROL, SAFETY AND COMFORT

J Ullman, HSBO PRO, Sweden

The need for recommendations on cockpit design has become more apparent with the fast growing number of new hydroplaning boats being built for professional use in sea rescue, law enforcement, coast guards and military agencies. Performance, control, comfort and safety can be greatly enhanced without any extra cost just by getting geometry and dimensions right from start. This paper establishes and explains the basic design elements necessary to optimise cockpits and steering consoles on hydroplaning boats for control, vision, safety and comfort. Objectives are to optimise all aspects, from wind and spray protection, sight lines, field of vision and glare reduction to instrumentation and postural control and vessel control, even under impact exposure. Recommendations are given based on scientific research and practical experience of designing dashboards, steering consoles and wheelhouses. Presentation is in basic "cookbook" style and explaining the perceptual and biomechanical conditions defining the requirements.

PRELIMINARY DESIGN TOOL FOR THE PERFORMANCE PREDICTION OF HIGH SPEED PLANING CRAFT IN IRREGULAR SEAS

E M. Fay, Cotty Fay Marine Design Inc.

A design tool has been developed to predict the performance of a planing craft in head seas. The program follows on with the work done by Zarnack, Fridsma & Martin. The new program improves the Runge Kutta integration of the differential equation to a more stable fourth order scheme. The program also improves the hull definition as well as the added mass calculation. The program predicts the heave, pitch and acceleration at constant speed in a random seaway in the time domain providing a direct comparison to full scale data. The results of the program are compared to full scale data on a number of different boats at a range of operating points and sea states.

Search & Rescue Craft

RNLI College, Poole, UK

DAY 2 PAPERS INCLUDE:

INSTRUMENTED FREE-RUNNING MODEL TESTS – THEIR APPLICATION TO SMALL HIGH SPEED CRAFT

S Phillips, I Shin, C Armstrong & D Kyle-Spearman, Seaspeed Marine Consulting Ltd

The use of instrumented free-running hydrodynamic models has recently enabled significant advances to be made in the understanding of high speed craft performance at sea. This paper outlines the benefits and challenges of this approach with reference to new SAR vessel designs (including the new RNLI Shannon Class all-weather fast carriageway lifeboat), to leading suppliers of fast wind-farm support catamarans who are using this technology to specify their new craft and to the designers of large ultra-fast super yachts investigating the high speed dynamic stability of their designs. Free-running model testing provides data that is not readily available from CFD or conventional tank testing programmes, in particular handling and manoeuvring characteristics, the assessment of limiting conditions such as stern sea plough-in, high speed dynamic instability and realistic slamming statistics and the craft's performance in extreme sea conditions. As well as discussing the benefits of the free-running test approach, the paper also highlights many of the challenges that still exist in attempting to predict full scale high speed SAR and workboat performance along with some of the lessons learnt in undertaking such tests.

SYNTHETIC VERTICAL ACCELERATION TIME HISTORIES FOR HIGH SPEED CRAFT

J Hirst, S Dyne & T Coe, QinetiQ, UK

High speed craft invitations to tender now often include requests for whole body vibration metrics and performance information prior to detailed seakeeping analyses using numerical methods or towing tank testing. A method is required to generate typical synthetic time histories based on a concept or pre-concept level design information in order to demonstrate performance. Similarly, for assessment of Whole Body Vibration (WBV) mitigation technologies, vertical acceleration time histories are required to exercise mathematical models of dynamical systems. In this case the desire to synthesise acceleration time histories stems from a lack of real acceleration data. This paper describes the development of a method to generate synthetic time histories based on craft parameters and sea conditions for both concept design work and WBV assessment purposes. A technique to synthesise vertical acceleration time histories for an arbitrary planing craft in prescribed conditions has been developed to alleviate this. The development process began with an analysis of the real data available and computational algorithms were generated to determine the statistical properties of wave slam time histories. A single, scalable synthetic wave slam was developed for use as the main component of the extended synthetic time history. Using the statistics of real acceleration time histories, and established methods of predicting average wave slam accelerations of planing craft, the expected time history statistics for an arbitrary craft in arbitrary conditions may be calculated. From the calculated statistics, and using the single scalable synthetic wave slam, a fully synthetic acceleration time history is constructed.

TECHNICAL SOLUTIONS FOR SHOCK MITIGATION ON HIGH SPEED GOVERNMENT CRAFT

T E Coe, K T Rutherford, S Dyne & J Hirst, QinetiQ, UK

The Control of Vibration at Work Regulations (2005) and The Merchant Shipping and Fishing Vessel (Control of Vibration at Work) Regulations (2007) along with EU legislation (2002/44/EC), place a requirement on employers to, among other things, mitigate the risk of harm from exposure to Whole Body Vibration and Shock. As part of the Maritime Whole Body Vibration project the ministry of defence is investigating a variety of technical measures which could be applicable to their in service and future vessels. This paper describes the work undertaken to date to develop solutions which will reduce risk to the MoD's employees to as low as reasonably practicable. This must be done while maintaining current maritime capability and integrating with current and future infrastructure and support Two cases are considered, solutions for the in service fleet and novel systems for future craft. For the in service case the challenges of understanding the requirements and constraints that exist across a diverse fleet and developing a military specification for shock mitigating technology are discussed and the MoD's solutions presented.
For future craft integrating shock mitigation into the design process from the concept phase means different options may exist to protect the end user. The paper describes the research efforts being undertaken by the UK MoD to understand the potential benefits from systems that cannot be easily retrofitted to craft and how best to integrate these into a balanced overall design.

DESIGNING MODERN MILITARY HIGH SPEED CRAFT. BALANCING CAPABILITY DEMANDS WITH MILITARY REQUIREMENTS

S Lee, NDP/BMTNG, UK

The growth in asymmetric threats and the use of high speed craft by pirates, terrorists and drug smugglers has lead to increased use of naval and coastguard high speed vessels for counter piracy, littoral operations and drug interdiction.
The designers of Government vessels are required to comply with class and flag state requirements. Pirate and terrorist vessels are illegitimate and therefore do not have to meet these demands. Government vessels have to comply with legislation to protect their crew from noise and vibration. These requirements demand sea kindly hull forms and potentially bulky systems to protect the crew, these can compromise craft performance if not managed correctly. NATO forces must comply with the common fuels policy restricting the use of the power dense petrol power units used by their adversaries and demanding the use of diesel power units with inferior power to weight ratio. Craft are also generally required to integrate with existing assets and infrastructure which impose spatial and weight constraints on the vessels. This paper describes how designers in the Naval Design Partnering Team are developing concept designs to balance the requirement to match asymmetric threats on the water while meeting the restrictions placed upon them by legislation and policy. The design implications of the specific challenges are explored and potential solutions are presented which demonstrate the authors' approach to balancing these disparate demands.

THE TEST COXSWAIN: THE HUMAN ELEMENT WITHIN TEST & EVALUATION

J Hill & T Dobbins, FRC International Ltd, UK

The acquisition of smaller marine craft has previously been a relatively simple process. Advancements in high-speed craft systems (e.g. high power density engines, light-weight structures and ruggedized electronics) means that they now have a much greater capability, price tag, and can out-perform their human occupants. Compared to displacement vessels, planning craft are much more dependent on the skill of the coxswain, e.g. throttle input, to operate them safely and effectively. This increased role of the coxswain highlights a procurement issue; a good coxswain can make a bad boat look good, whilst a poor coxswain can make a good boat look bad. Both scenarios potentially result in poor procurement decisions, reduced safety and increased through-life problems/costs. To support the Test & Evaluation (T&E) process, a Test Coxswain education and training course has been developed, leveraging expertise from the aviation Test Pilot community. This increased quantification of the T&E process, using tools such as rating scales and data/video systems, supports both the requirements/specification, as well as the assessment phase. As an integral part of the Systems Engineering Process the Test Coxswain helps to ensure that a common language is spoken between the end-users and the designer/engineer. Therefore the development of the Test Coxswain supports both the Naval Architect/Designer community and ensures that the craft used in the harsh marine environment are fit-for-purpose, safe and enhance the performance envelope.

INFORMATION ARCHITECTURE FOR FAST RESPONSE CRAFT – COMMAND & CONTROL & HUMAN SYSTEMS INTEGRATION

T Dobbins[1], F Forsman[2,3], J Hill[4], T Brand[5], J Dahlman[2], D Harris[6], A Smoker[7], J Stark[8] & S MacKinnon[9]

1-STResearch, UK; 2-Chalmers University, SWEDEN; 3-Swedish Sea Rescue Society, SWEDEN; 4-Trident Marine Ltd, UK; 5 - VMT, CANADA; 6 - HFI Solutions Ltd, UK; 7-NATS, UK; 8-US Navy, USA; 9-Memorial University, CANADA

Command and Control (C2) is required for safe and effective maritime operations. To facilitate effective decision-making and C2, it is essential that the crew can access the required information. It is therefore essential that the appropriate information architecture is used. Navigation, being an essential aspect of C2, has seen a radical change from paper charts and individual instruments to computer systems capable of sophisticated data fusion to provide enhanced situational awareness. There is a continuing debate on the use of electronic navigation aids, for which the usability of such systems has been questioned. Fast response craft operations use a methodology, defined by Forsman (2010), known as DYNAmic NAVigation (DYNAV). This provides the basis for developing a standardised navigation display information architecture. The development of the required information architecture is not a software/engineering issue, but rather lies within the human factors domain as it requires an understanding of how humans perceive information, how they use mental model(s), and subsequently make safe and effective decisions. Part of the information architecture and Human Systems Integration (HSI) solution ensures that the system is useable, e.g. how the display is configured, controlled, how menu structures operate and how the system is installed within the console/cockpit/bridge. This standardized DYNAV methodology and Information architecture, as well as enhancing safety, performance and interoperability, reduces the training burden on the crew and operating organization and is supported by e-learning and simulation based training systems.

HOVERCRAFT TO THE RESCUE

B Russel, Hovercraft Society, UK

The amphibious hovercraft has made a significant contribution to the search and rescue role and in humanitarian activity.In the pure search and rescue role in the UK a number of agencies, including the RNLI, use small hovercraft on adjacent tidal mudflats. In Eastern Europe hovercraft are used on frozen rivers, where a fast response is essential. Similarly, for transport in flooded areas, small hovercraft have proved effective for search and rescue and for the transport of equipment,goods and personnel. There are a number of airports around the World that are adjacent to shallow water or mudflats and medium sized hovercraft are employed in case an aircraft goes down in these areas. The hovercraft carries enough liferafts, which with its own capacity, can support the passenger load of the largest aircraft. However, it is in response to disasters and to overcome transport difficulties in remote areas that the greatest contribution has been made. In areas that suffer from flooding and disruption of traditional transport, the larger military hovercraft in service with the US Forces can move large volumes to areas only alternatively accessible by helicopters. In the developing world, where transport infra-structure is at a minimum, small utility hovercraft can use rivers, even if rapid strewn, as natural highways. This enables medical aid to be taken to remote centres of population and for patients to be carried quickly to hospital. Food and other supplies can also be taken to where they are needed.

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International Conference

SURV 8

20 - 21 MARCH 2013
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VENUE
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