

RINA

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International Conference

THE AFFORDABLE WARSHIP

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Sponsored by:



day 1

09.00 - 09.35 COFFEE, REGISTRATION & WELCOMING SPEECH

09.35 - 10.10 WHOLE LIFE COST CONSIDERATION FOR PROCUREMENT OF AN RFA TANKER

P. Havron, Frazer-Nash Consultancy Ltd, UK

A number of existing Royal Fleet Auxiliary (RFA) vessels require replacing and to ensure Value for Money (VfM) the winning solution needed to be assessed from a Whole Life Cost (WLC) basis. The procurement strategy was based on an open international competition under competitive dialogue. The MoD required the Bidders to submit WLCs with supporting evidence for the key through life support cost drivers, such as fuel, planned maintenance and paint applications. With this in mind, Frazer-Nash was commissioned to initially establish a robust RFA WLC baseline and then review the Bidders' submissions to provide dialogue as part of the competitive dialogue process. This paper articulates the process and rigour required to ensure the successful Bidders' proposed design provided the best VfM from a WLC perspective.

10.10 - 10.45 CHALLENGES IN DESIGNING AFFORDABLE WARSHIPS

S. Knight, MoD, UK

A modern warship is a complicated compromise between capability and safety, supportability & sustainability, all within the bounds of the generic term 'affordability'. To be considered an effective asset, new warships should incorporate the latest technologies to counter evolving threats - technologies which may themselves be complicated and unproven in the marine environment. The paper will determine in a considered manner the major drivers on the design of the vessel, these will then be described in terms of the consequences of the standard or capability on the design, from which conclusions will be drawn as to the impacts upon cost and affordability. With a view to looking to the future, the paper will conclude with a summary of the major findings and attempt to draw some conclusions on the challenges in designing affordable warships.

10.45 - 11.05 COFFEE BREAK

11.05 - 11.40 VORGES - A COMPREHENSIVE APPROACH FOR THE PLANNING OF FUTURE NAVAL VESSELS

G. Gerdemann, MTG Marinetechnik GmbH, Hamburg, Germany

Based on experience - the available budget for the procurement is not sufficient to fulfil all requirements associated with the new naval vessel. The core issue concerning the planning of a future naval vessel is to find technical solutions for given requirements which are affordable in line with the budget. Due to the complexity of a naval vessel it is impossible to answer this question by assigning a specific amount of money to a specific requirement. In fact it is inevitable to estimate the procurement and life cycle costs of a naval vessel based on a complete system design with a given set of requirements. This is what VORGES does in an efficient and structured way. The German MoD takes advantage of the VORGES-Methodology when it comes to the planning and procurement of new naval vessels for the German Navy.

11.45 - 12.20 COST CONSIDERATIONS WHEN DESIGNING FLUID CONTROL AUTOMATED SYSTEMS IN SHIPS

S. Murguia, Rotork, UK

In order to reduce operating costs on the next generation of warships, navies and manufacturers have been developing survivable and affordable automation technology. Within auxiliary systems, fluid control systems are critical in a ship. System automation can provide reliability, and a fast response to changes in system conditions. This paper looks into traditional automation and control techniques such as hydraulic or pneumatic powered valve actuators that were typically used in these systems, the evolution towards electric systems, and developments in technology that led to their integration with 2-wire communications networks. Cost implications of each of these systems will be discussed along with their impact on construction costs and particularly, on total ownership costs.

12.20 - 12.55 IMPROVING WARSHIP AFFORDABILITY THROUGH INTEGRATED MAST SOLUTIONS

W. Van Oosterhout, Thales, The Netherlands

The Integrated Mast, an innovative, integrated topside design approach, represents a new paradigm in naval shipbuilding. It is a single system of systems solution to the changing missions of Navies, with increased operational performance and -availability, reduced risk, shorter shipbuilding time, improved maintenance requirements and more space below deck. This paper describes how the Integrated Mast matches the challenges of Navies today, and prepares for the ones in the future. It improves warship affordability by reducing programme uncertainty and decreasing the logistic footprint.

12.55 - 13.55 LUNCH

13.55 - 14.30 ADVANCED CAD - PLM INTEGRATION IN A NAVAL SHIPBUILDING ENVIRONMENT

F. Alonso, C Gonzalez & R Perez, SENER, Spain

Military shipyards building surface ships and submarines are implementing PLM Systems as a global solution to the management of information through the life cycle of naval vessels, with the objectives of increasing productivity, reducing vessel design and production times, saving costs and improving the quality of the whole process. This paper presents an advanced architecture for CAD - PLM integration in a naval shipbuilding environment. The architecture of the solution contemplates a bi-directional flow of information between both Systems, in such a way that the most relevant vessel items can be defined in CAD or in PLM depending on the design stage and on the maturity of the available information.

14.30 - 15.05 A NOVEL DISPLACEMENT MONOHULL SHAPE FOR IMPROVED FUEL CONSUMPTION AND HABITABILITY

C. Pettinelli, CD-adapco, Italy

The paper describes the hydrodynamics characteristics of a novel type of displacement hull called TopGlider, which exceeds the critical speed of the typical displacement monohull. Simulations results of 3-dimensional CFD code are compared with towing tank data and a full scale test model of 14.5 m. The scalability of the new design is analyzed for a range of ship lengths, and compared with reference displacement and planing hulls. The study aims to demonstrate the advantages of the design at a wide speed range. The main focus will be on substantial fuel savings due to significant reduction of hydrodynamics resistance. Other important aspects such as reduction of wave making and radar signature, and increase of on-board space are presented.

15.05 - 15.40 COMBINING INNOVATIONS TO CUT COST & INCREASE CAPABILITY; A NEW SUPER COMPACT SURFACE COMBATANT IS BORN

G. Whitaker, Missionkraft & N. De Waal, Teknikraft Design, UK

From the adoption of iron warships to nuclear powered submarines, Naval users have always pioneered technology to improve capability. Active foil-assisted hulls give new levels of performance, stability and fuel efficiency. New propulsion technology both propeller and jet drive systems increase performance by up to 80%. New inboard stabiliser technology improves comfort and crew effectiveness at loiter and slow speed without any vessel drag or signature. Ultralightweight fully stabilised RWS and missile systems enable high density weapons deployment while rotor-winged UAVs can deploy from the broad mission deck. These advanced technologies can be applied to many vessel configurations that will increase capability while reducing capital, operating and fuel costs. This paper illustrates the Missionkraft 50m Littoral Patrol Vessel.

15.40 - 16.00 COFFEE BREAK

16.00 - 16.35 PRE CONCEPT DESIGN SPACE EXPLORATION USING PARAMARINE

V. Vagliani, MOD - QinetiQ, UK

The UK Ministry of Defence has in collaboration with QinetiQ GRC, developed a software tool to facilitate initial exploration of the potential design solution space at a pre-concept ship design stage. The tool has been developed with the primary aim of providing design teams with the ability to understand the approximate technical and cost implications of large numbers of design and capability options. Automation of the design process at this exploratory stage of ship design presented many challenges and identified certain limitations, but also demonstrated many benefits, all of which are discussed. While described in this paper in the context of Naval Auxiliary ship design, the tool has been developed in a generic manner with the intention that other ship types can be investigated.

16.35 - 17.10 THE AFFORDABLE MODULAR FRIGATE - A DESIGN STUDY

L. Collins, P. Ward, UK MoD, G. Davidson, RN & P. Fonseca, Portuguese Navy

The growing cost of individual naval platforms has led to decreases in fleet size with little reduction in Royal Navy commitments. Against this background the Affordable Frigate Project was executed working to a budgetary constraint of £6 billion. The Project led to a 23 ship solution, relying on specific role vessels demonstrating a high capability across the fleet, the design allowed for modest manning, considerable fuel savings, and the potential for technology insertion through-life in response to expected fossil fuel restrictions. In summary, the Affordable Frigate Project offered the versatility that an uncertain future demands, while challenging the assumption that 'affordable' means nothing more than 'cheap'.

17.10 - EVENING DRINKS RECEPTION

This represents a preliminary program

day 2

08.30 - 09.00 COFFEE AND REGISTRATION

09.00 - 09.35 BRINGING EFFICIENCY IN THE NAVAL SHIP DESIGN PROCESS WITH COTS SOFTWARE

T. Holmberg, Napa Ltd & R. Kotiranta, Surma Ltd, Finland

The requirements for modern naval vessels are becoming more and more complicated each year due to the different tasks and environmental scenarios that the vessels must be designed to comply with. This paper presents new possibilities and practices which enable shorter design cycle times resulting in better designs by utilizing currently available commercial-off-the-shelf software. This is highlighted with some examples, having a special focus on finite element model creation, combat survivability assessment and kill criteria for both personnel and equipment, thus yielding in the assessment of mission capability level.

09.35 - 10.10 AN INTEGRATED APPROACH TO NAVAL SHIP SURVIVABILITY IN PRELIMINARY SHIP DESIGN

D.J. Andrews, A.S. Piperakis, R. Pawling, University College London.

The rising cost of warship procurement, coupled with declining defence budgets, has led to a reduction in the number of ships in most western navies. Innovation in both the design process and individual ships is necessary. A number of survivability assessment tools currently exist; however, most fail to integrate all survivability constituents in that they are unable to balance between the component features of survivability. There is thus a need for a simple, rapid method for better integrating and quantifying survivability in early stage ship design. Since survivability is sensitive to layout, it is proposed that the method should take advantage of architecturally orientated ship design approaches. In this paper, such a method is proposed and demonstrated on three frigate design variants.

10.10 - 10.45 THE INFLUENCE OF SURVIVABILITY IN THE DESIGN OF A CAPABLE, AFFORDABLE SURFACE COMBATANT

J. Schofield & P. Horstmann, Survivability Consulting Limited

M. Robb & D. Lewis, BAE Systems Maritime - Naval Ships, UK

This paper will explore the survivability management process being used for a recent Surface Combatant Design. It will cover the design options being explored and the modelling being used in support of these choices, with particular focus on the strategies for the protection of ship's crew, systems and key spaces. The paper will explore the vulnerability assessment process of the reference design, quantification of the effect of the design options, presentation of the design option cost/benefit and trade-off between the options.

10.45 - 11.05 COFFEE BREAK

11.05 - 11.40 SURVIVABILITY OF CHILLED WATER NETWORK ON BOARD SHIPS WHEN USING DINCS

C. Smit, TNO, The Netherlands

When a chilled water distribution network on board a naval ship is damaged, fast reaction is required. The only solution for that is using an automated recovery approach. Recovery mechanisms are being developed for improvement of current platform management systems. Recently, the effectiveness of automatic recovering a chilled water network from damage has been analysed on the basis of computer simulations. The simulation results show that preventing fatal emptying of the distribution network can be realised. Moreover, maintaining and restoring water supply to undamaged parts of the network can be achieved to a large extent automatically. As an indication of the effectiveness of the recovery mechanism, maintaining capabilities as defined in the command aim is used.

11.40 - 12.15 SHIPBOARD DAMAGE CONTROL AND RECOVERABILITY SIMULATIONS

J. A. W. Sajdak, Alion Science and Technology, USA

A common interpretation of survivability is providing the capability of a warship to "Fight Through" damage. The effectiveness of any onboard "survivability enhancement system" depends on the ability of the crew to work with the system in mutually beneficial damage control efforts. Simply stated, effective survivability requires effective damage control and effective damage control requires the knowledgeable use of advanced equipment and techniques to prevent or minimize the damage effects caused by battle damage, fires, collisions or groundings. Within this paper, the authors illustrate the use and discuss the benefits of damage control and recoverability simulations and crew trainers developed to support enhanced damage control and recoverability aboard modern warships.

12.15 - 13.15 LUNCH

13.15 - 13.50 DESIGNING THE PROCESS AND TOOLS TO DESIGN AFFORDABLE WARSHIPS

B. van Oers, NATO, The Netherlands

The current economic climate forces Western navies to develop new warships in an austere fiscal environment; an environment that makes affordability a primary concern during the procurement process. Such affordability, in turn, is achieved only by balancing budget and political ambition early on, i.e., during early stage ship design, and by maintaining the balance throughout the design, engineering and production process. This paper proposes the process and tools to help naval architects find and maintain a balance between affordability and ambition during the early stage design of warships to be procured for the Royal Netherlands Navy.

13.50 - 14.25 The implications for affordability, ship impact and shock response of simplified warship structural styles

N. Bradbeer & D. Andrews, UCL, UK

Warships structures are generally complex, expensive and optimised for minimum weight. There are a number of stylistic changes which could be adopted to reduce their cost. These changes have implications for the structural cost and weight, as well as how the structure reacts to shock loading from underwater explosions. This paper explores the implications of adopting three stylistic choices to reduce warship structural costs. The reaction of each structure to an underwater explosion of fixed parameters was simulated using FEA with a fluid-structure-interaction component. This allowed the resultant accelerations experienced at equipment mountings throughout the ship to be assessed. The distribution of these accelerations for each design series is presented, allowing an appreciation of the change in shock response performance to be compared to the changes in cost and conclusions to be drawn.

14.25 - 15.00 DOING MORE WITH LESS - BALANCING OPERABILITY AND SURVIVABILITY WITH COST FOR CORVETTE DESIGNS

A. Jones, BMT, UK

Ships are driven to designing to cost rather than capability and there is a great appetite for international partnering and collaboration in order to benefit from economies of scale. This also drives greater integration of commercial practice and systems into warships and more flexible or multi role platforms. This change in focus impacts the war fighting capability of the ships and proving value for money and finding the correct balance between the capability and militarisation of a design is increasingly difficult. This paper seeks to investigate the design space for a corvette and investigate the military effect provided by varying the militarisation and size of a design.

15.00 - 15.20 COFFEE BREAK

15.20 - 15.55 AN INNOVATIVE DESIGN OF A FAST PATROL BOAT FOR CONSTABULARY OPERATION IN SHIPPING CHOKE-POINTS

D. J. Bricknell & M. O'Connor, Rolls-Royce, UK

This paper looks at the design of a single-purpose high-speed patrol vessel for conducting constabulary operations, intercepting and boarding suspect vessels, and providing presence at global shipping choke points. High-speed, high-maneuvrability, large platform size together with a simple weapon system are the key characteristics ensuring dominance in constabulary and other unsophisticated threat situations. An innovative, low-resistance, steel mono-hull design provides the low-cost space; a high-power, and highly power-dense, propulsion system provides the low through-life cost answer to speed; and the latest systems for launch and recovery of UxVs provides the flexibility for current and future systems- these three features are all described in detail.

15.55 - 16.30 THE AFFORDABLE HOVERCRAFT: A FLEXIBLE MODULARIZED DESIGN

G. Gougoulidis Hellenic Navy, Greece

A number of modern naval combatants depart from the traditional displacement hullform as they belong to the family of advanced marine vehicles, and thus have increased costs. Air Cushion Vehicles (ACVs) represent such an advanced vessel, and although their history spans a width of more than half a century, they haven't caught on as a popular marine vehicle. They have never been produced in great numbers, with the LCAC of the US Navy being the only exception, and for this reason, economies of scale and ultimately affordability were never allowed for. This paper does not merely propose another design, but rather an innovative method and design philosophy based on a flexible modularized design around which an affordable hovercraft can be built.

16.30 - GENERAL DISCUSSIONS

