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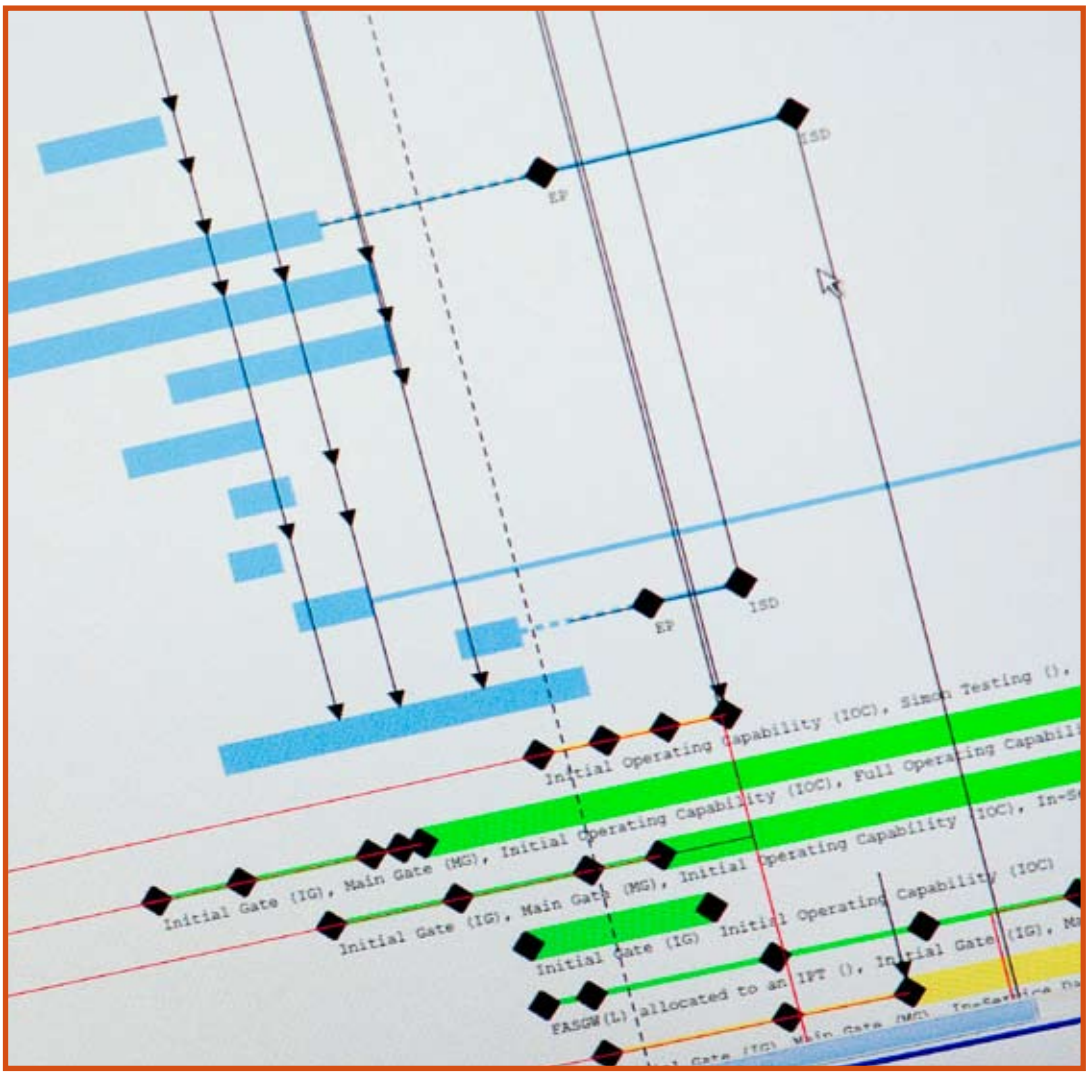

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SYSTEMS ENGINEERING IN SHIP & OFFSHORE DESIGN

21 - 22 OCTOBER 2010

BATH, UK

SYSTEMS ENGINEERING IN

21 - 22 Oct

Systems engineering brings structure, discipline and teamwork to any large project and has an increasingly valuable part to play in naval architecture and marine engineering design. The prompt delivery of high quality ship and offshore asset designs is made possible by ever more advanced design methods but also poses major challenges as management teams try to balance capability and cost across global markets. The many risks and interdependencies are best addressed within a systems engineering structure that brings together all the disciplines involved and represents a single unified view of the project.

Whether the emphasis is on project management, operations, structural design, equipment configurations or environmental sustainability, the many variables can be captured within a coherent framework that is readily understood by everybody involved. Based on a sound understanding of the original requirements, multiple concepts can be developed with lifecycle management, safety and environmental issues fully integrated from the start.

The Conference will showcase how Systems Engineering principles can make best possible use of the available skills, technologies and tools available to the marine industry as it faces up to the challenges of present and future markets.

day 1

08.30 - 09.00 COFFEE AND REGISTRATION

09.00 - 09.35 MARINE REQUIREMENTS ELUCIDATION REVISITED
David Andrews, RCNC

The paper looks at the origins of the concept of Requirements Engineering, within systems engineering, when specifically applied to naval engineering acquisition practice. This is contrasted with consideration of the actual nature of the initial design of physically large and complex systems, typified by modern naval vessels. Requirements Elucidation, as the strategy to tackle the inherently "wicked problem" of determining what is really wanted of a naval vessel and what can be afforded, is then addressed, followed by drawing specific insights from a series of design studies undertaken by the UCL Design Research Centre, under the direction of the author.

09.35 - 10.10 RESOLVING COMPLEXITY - WHY SYSTEMS ENGINEERING WORKS
Edwin Swidenbank, Atkins Defence

This paper describes how the ISO 15288 standard can be used as a framework to support a holistic solution when it is supported by an integrated development environment, based on model driven engineering. The paper will show the life-cycle of a conceptual naval vessel, detailing how development progresses in an integrated and coherent way, from stakeholder needs through to requirements specification, covering the system through-life. The paper will also show how ISO 15288 processes are executed in a model driven environment using the UK MOD's Architectural Framework (MODAF), to support not only equipment centric design, but other disciplines such as safety, human factors and supportability.

10.10 - 10.45 PROJECT ARCHITECTURES FOR SHIP DESIGN
Ralph Hudson, BMT Defence Services Ltd

This paper takes forward the arguments presented by the author at the RINA International Conference on Computer Applications in Shipbuilding (ICCAS) in September 2009 and discusses how practical systems engineering strategies are being evolved to support the next generation of naval ship designs. The means exist to set up an integrated project environment but there are many challenges along the road to achieving one that is well matched to the design processes, skills, backgrounds, organisation and location of an individual project.

10.45 - 11.15 COFFEE

11.15 - 11.50 THE APPLICATION OF SYSTEMS ENGINEERING PRINCIPLES TO THE DESIGN AND PROJECT MANAGEMENT OF MAJOR WARSHIP PROJECTS.
David Downs, BAE Systems Surface Ships

This paper is based on the combined experience of the authors in the management of major warship projects including LPH, LPD(R), AO and Type 45. It describes the Lifecycle Management processes employed in both the design and the project management of these projects. The paper also discusses the application of lessons learnt from these projects to the authors' current roles in the Queen Elizabeth Class aircraft carriers and the Future Surface Combatant projects.

11.50 - 12.25 A COMPREHENSIVE REFERENCE MODEL FOR REQUIREMENT-CENTRIC AND DATABASE DRIVEN SYSTEM DESIGN IN NAVAL PROGRAMS.
Martin Hoppe, TKMS Blohm & Voss Nordseewerke GmbH

Requirements managements, traceability and information consistency as part of the systems engineering process are success factors during the proposal phase of complex naval vessels. TKMS Blohm + Voss Nordseewerke has developed a reference model and the systems engineering tool 'Design DataBase' to group, categorize and analyze information submitted with the request tor proposal.

12.25 - 13.30 LUNCH

13.30 - 14.05 NEW ARCHITECTURAL FRAMEWORK FOR MILITARY SHIPS
Marc Peyrichon, DCNS

In DCNS, frameworks as DoDAF (Department of Defense Architecture Framework) or AGATE, for example, are currently used for the design of Combat Management Systems of frigates and submarines. These architecture frameworks are now suitably supported by tools of the market and they help the stakeholders, the system architects and the engineers to organize their process and to share common views during the architecting phase of a project. Nevertheless they remain mainly dedicated to C4ISR , whereas generally the design of a military ship also requires to clarify exactly the architecture of the platform.

14.05 - 14.40 IDENTIFICATION OF THE COMMON FUNCTIONS OF A MULTI-ROLE VESSEL TO AID BASE PLATFORM DESIGN
Brett Morris, DSTO

The paper focuses on the requirements analysis and functional definition steps within a MRV system's concept design phase. A process is developed that can identify the functions that will be common across the roles that a MRV is to perform during these two steps. In the process, Systems Engineering approaches and tools are adopted and used in consultation with the stakeholders to identify a set of functions the MRV will perform. The validity of the process is tested using a pilot study for a MRV that will carry out patrol, mine counter measure and hydrographic survey roles.

14.40 - 15.10 COFFEE

15.10 - 15.45 SYSTEMS AND SAFETY ENGINEERING - A COMBINED APPROACH DURING CONCEPT DESIGN AND BEYOND
Alastair Shanks, BMT Defence Services Ltd

This paper aims to discuss the influencing factors within the UK MoD that have resulted in a move towards the use of a systems engineering approach for the development of a Safety Case and Requirements Set for a platform. It draws on the experiences and understanding of the authors who are currently heavily involved in a major procurement project within the UK MoD and aims to present a framework approach that can be used across projects from different domains.

15.45 - 16.20 RISK, SYSTEM BASED DESIGN AND CLASSIFICATION
Mark Wharton, Lloyd's Register

The established, prescriptive approach to machinery Classification, relies on the assessment of individual items of equipment that have proved to be, or are considered to be, important. This approach is increasingly questionable and should be challenged with regards to its suitability for modern ship systems and their integration. This paper discusses the approaches required to meet new demands placed on Class for such systems.

16.20 - 16.55 RISK INFLUENCING FACTORS RELATED TO CAPSIZING OF ANCHOR HANDLING VESSELS: IN VIEW OF THE BOURBON DOLPHIN ACCIDENT
Girirajasekhar Gunnu and Torgeir Moan, Norwegian University of Science and Technology
Haibo Chen, Scandpower Risk Management China Inc

The objective of this paper is to illustrate how risk factors associated with environmental, technical, human and organizational issues affect the safety of anchor handling operations by using the Bourbon Dolphin accident as a case. In general all the risk factors may not be present in a given accidents. The factors not present can lead to high risk level in other scenarios. Hence it is necessary to establish a more complete risk picture.

16.55 - EVENING DRINKS RECEPTION

SHIP & OFFSHORE DESIGN

tober 2010

day 2

08.30 - 09.00 COFFEE AND REGISTRATION

09.00 - 09.35 AN APPROACH TO IMPROVE THE TENDER PROCESS IN SHIPBUILDING
Ms Elena Moredo, Delft University of Technology, The Netherlands
Marnix Krikke, Scheepsbouw Nederland, The Netherlands

The paper addresses current research on how to improve the tender processes and the co-operation between the shipyards and system-integrators. Several Dutch shipyards and system-integrators join forces to improve the current way of tendering by implementing a Systems Engineering (SE) approach. The main aim is to reduce the lead time of the tender phase and to improve the way they co-operate during this phase.

09.35 - 10.10 SYSTEMS ENGINEERING IN THE SUCCESSOR SSBN PLATFORM DESIGN
David G Croucher, BAE Systems Submarine Solutions

This paper overviews the manner in which Systems Engineering has to date been applied to the Nuclear Submarine Successor SSBN Programme, and how certain generic lessons learnt from the Astute Programme have strengthened an understanding of areas where particular emphasis needs to be put in the application of Systems Engineering. Focus is given on how Systems Engineering helps to drive crucial milestones in an integrated manner to deliver time constrained projects.

10.10 - 10.45 A STUDY ON BUSINESS MODEL BASED DAMAGE CONTROL SUPPORT SYSTEM DESIGN
Hee Jin Kang, Korea Ocean Research & Development Institute

To follow the DoDD 5000.1 and to guarantee project success, a study has been taken to allow business model as a tool of “system analysis and control” in the systems engineering process. The proposed process has been applied to a system design project of damage control support system design. The business model used to analyze and control the result of “functional allocation and analysis”, “synthesis” process. By using this new design process, it is possible to design a reasonable system for damage control support with minimize the number of physical components.

10.45 - 11.15 COFFEE

11.15 - 11.50 DESIGN FOR SYSTEM AVAILABILITY AND OBSOLESCENCE MANAGEMENT
Xiangqun(Quentin) QIU, Department of National Defence, Canada

The ever increasing challenges are caused by the combination of following trends: adopting more COTS (commercial-off-the-shelf system) in defence system; new components, materials, technologies introduced by innovation and/or legislations; the increasing density and complexity in electronics designs; the increasing use of open source and off-shore software programming creates software that are neither fully tested nor understood; increasing interest and sophistication in information security attacks resulting unacceptable operational availability, and comprised system integrity. The paper will address the challenges and the considerations in several areas: setting up and validating system availability requirements, supportability and obsolescence management, influence on early design and design for system engineering, and ILS consideration of “all-causes” (hardware, software, human factors, security etc.).

11.50 - 12.25 WARSHIP DESIGN MATURITY MEASUREMENT AND ANALYSIS THROUGHOUT THE LIFECYCLE
Neil Harrison, BAE Systems Surface Ships

Undertaking concurrent design activities on such a large and complex product - with an extensive and equally complex supply chain - leads to a certain amount of design change being unavoidable, as the design evolves towards final product. In reality this change takes place throughout the entire design and manufacture of any FOC, right through to product delivery and often beyond. As such, it is the remit of maturity management to measure, analyse and fully understand the state of information maturity at all times in the design process. This paper explores the concept of maturity from basic causal level, through how to intelligently measure maturity levels and looks at management and prediction techniques with a view to controlling levels of change caused by immature design information.

12.25 - 13.30 LUNCH

13.30 - 14.05 A SYSTEMS ENGINEERING APPROACH TO COMPLEX WARSHIP INTEGRATION
Mark Salathiel BAE Systems Surface Ships

As warships have become ever more complex, the approach to whole ship integration is shifting from discipline led to a whole ship system approach. This paper presents the transformation activities that BAE Systems Surface Ships has taken to implement a Systems Engineering approach to successfully integrate warships. The challenges in design will be presented, followed by a description of the approach implemented to meet these challenges, and the lessons learnt to date.

14.05 - 14.40 THE QUEEN ELIZABETH CLASS AIRCRAFT CARRIERS - HOW SYSTEMS ENGINEERING HELPED TURN DREAMS INTO REALITY
Dr Michael Purshouse, ThalesUK

This paper will describe how systems engineering techniques applied throughout the formative years helped to provide a stable framework for development with convergence on an optimal solution. By the time approval to start manufacture was being sought, it could be shown that all requirements agreed with MOD Capability Sponsor would be met; that value-for-money considerations had been at the forefront of all major decisions; and that the solution being offered had been captured in a form that industry could relate to and were prepared to commit to deliver in a co-operative multi-company Alliance including MOD itself.

14.40 - 15.10 COFFEE

15.10 - 15.45 R-F-L-P FOR SHIPBUILDING
Christian Barlach, Dassault Systemes

System Engineering has been used in the military segment of the shipbuilding Industry for many years. Derived from the DOD 5000 process, Navy organizations have deployed these processes to support the development of new vessels concepts to lower the risks of first-of-a-kind ship designs. Commercial shipyards can also benefit from System Engineering by incorporating similar best practices in their new ship designs. With the growing demand for designs that reduce emissions and deploy “green” technology, shipbuilders are faced with the challenges to do this at limited risk. Systems engineering practices calls for advanced information technology support – IT environment that can manage requirements, functional design and final production in a collaborative environment.

15.45 - 16.20 GOAL-BASED DESIGN OF MARINE SYSTEMS
Jakub Cichowicz and Dracos Vassalos, University of Strathclyde

Immediately after the introduction of the rules and attempting to implement the ensuing requirements it became obvious that SRtP is a Pandora’s Box. The realisation that coupling complex marine systems to the complexity of the ship/asset environment and ensuring availability of safety critical systems in all pertinent marine accident scenarios demands a step change in marine engineering systems design, led to the unprecedented situation in rule development of “watering down” the original rule intention whilst attempting to provide explanatory notes for its implementation. However, such reaction is understandable considering that, lack of a structured approach to address such complex constructions must inevitably lead to either unsafe or expensive designs.

16.20 - 16.55 SYSTEMS ENGINEERING - THE KEY TO SAFER MARINE VEHICLES
Vaughan Pomeroy, University of Southampton

The paper will also compare the use of automation in ship design practice with the achievement in other transport sectors, particularly aviation, rail and road. The author will particularly make a comparison of the way that automation is used to constrain the operator within a safe working envelope, providing an active support to the operator. The paper will present some initial ideas about using “safe operating envelope” systems in terms of the technical challenges, the demand for knowledge and understanding, the potential for technology transfer and the potential benefits in terms of reduced operator workloads, particularly in the most challenging situations. The evidence from the aviation industry relating to the introduction of similar concepts and the engagement with the users will be considered.

16.55 - GENERAL DISCUSSION

International Conference

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21 - 22 OCTOBER 2010
THE ASSEMEMBLY ROOMS, BATH, UK

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Following the end of day one (21st October), delegates are invited to attend an evening drinks reception at the conference venue.

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