International Conference

THE HISTORIC SHIPS

The Royal Institution of Naval Architects

Conference Programme

International Conference on Historic Ships

5th & 6th DECEMBER 2013
AT THE RINA HEADQUARTER, LONDON, UK

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DAY 1 PAPERS INCLUDE:

FROM COUTA BOAT TO DARING CLASS DESTROYER - THE HISTORIC FLEET OF THE AUSTRALIAN NATIONAL MARITIME MUSEUM
L Shaw, Australian National Maritime Museum, Australia
Opening in 1991 the museum's role is the preservation and presentation of Australia's maritime heritage. Included in this role is the maintenance and display of a number of floating vessels, out of water storage and display of watercraft (including Indigenous examples), and the leading role in operating the Australian Register of Historic Vessels (ARHV) which presents vessels of all types and sizes built up to 1965 relevant to Australia's maritime heritage. This paper will offer an overview of the museum's vessel collection, discuss the management plans put in place for these vessels, review the success of and future plans for the ARHV, and describe the museum's recent maritime archaeology expeditions. Lindsey Shaw is a senior curator at the Australian National Maritime Museum and has worked in the curatorial section since 1986; she is a committee member of the Naval Historical Society of Australia and a member of the Board of Directors of the Historic Naval Ships Association.

THE EVOLUTION OF SHIP STRUCTURES FROM ANTIQUITY TO THE PRESENT DAY
P A Caridis, National Technical University of Athens, Greece
An account of the development of ship structural design from the prehistoric period until the present day is given. The most important stages are highlighted and an effort is made to trace the evolution in design concepts that are intimately related to fabrication practice.

STUDY OF DESIGN AND MANUFACTURE OF CHUNDAN VALLAM - SNAKE BOATS OF KERALA
A Shetty, Bureau Veritas, India
The Snake Boat or "Chundan Vallam", as it is known in the local language of Kerala, is a type of racing boat with a history of over 400 years. Although originally designed and used as a warship, it has made its name over the centuries for its racing abilities. With a length of about 130 feet and a capacity to carry over 100 oarsmen, it is quite an engineering feat as the boat speeds across the backwaters. The paper will analyze the design and manufacture of these boats by applying modern ship design principles and also compare the results with similar crafts used currently. This will provide an opportunity to learn from traditional boat building practices and also explore areas to improve and preserve these techniques.

ARCHAEOLOGY OF CHINESE ANCIENT SHIP AND STRUCTURE MECHANICS ANALYSIS
Y Wu, Wuhan University of Technology, China
As a commander and special envoy which was assigned by the emperor of China in Ming Dynasty, Zheng He navigated in a great fleet to nearly 30 countries in Asia and Africa to have technical and economic communications which was warmly welcomed by local people. Until nowadays people in Southeast Asia regarded Zheng He as god and bless for him. The excellent navigation technique of fleet of Zheng He's treasure ships can be proved by the Zheng He Navigation Chart which was the product of Zheng He scientific navigation experience. According to the literature in Chinese History and archaeology results of excavated ancient ships, the treasure ship was reformed in accordance with Chinese ancient ship building technique. Moreover the strength of such ship was calculated and analyzed by structure mechanics. It is proved that the ship has enough strength with such size to ensure the safety of navigation.

HISTORIC SHIPS IN OPERATION; TARGETTING SUSTAINABILITY AND SAFETY
J Robinson, International Historic & Traditional Ships Panel, UK
A majority of historic ships need to generate revenue if they are to be properly maintained. In this operational role, full compliance with safety regulations is imperative.So far as is consistent with safety,operators may reasonably request that regulations written with newly-built commercial passenger vessels in mind may be interpreted in such a way as to respect the historic significance of the vessel and minimise the addition of visually-incongrous modern fittings. The growing popularity of maritime festivals encourages international voyages by historic vessels,which will need to satisfy inspections by the shipping administrations of host nations. The paper will introduce and explain the role of a new international expert panel that has worked for more than a year to agree and harmonise best practice across international frontiers. A crucial part of this task is to agree terminology for defining "historic ship", a concept which can vary widely according to national perceptions. The speaker is outgoing Chairman of the Registration sub-committee of National Historic Ships UK. He also serves on the Executive of European Maritime Heritage,and on the International Historic & Traditional Ships Panel.

REPLICATING HISTORIC VESSELS
M Heighton, National Historic Ships, UK
This paper discusses the different approaches to vessel replication within the UK and world-wide. It focuses on the replication terminologies set out in the guidance manual 'Conserving Historic Vessels' and defines the differences between a 'true replica'; a 'hull replica'; an 'operational replica'; a 'hypothesis'; an 'operational hypothesis', and a 'representation', giving examples of each. Consideration is given to the circumstances when it may be appropriate to construct a replica vessel and what the objectives behind such a build might be. Possible sources to inform the replica build will be outlined, as well as the range of factors which might lead to compromises in construction such as materials, modern tools, safety factors and operational regulations. In response to the growing number of replica vessels, and the need for a deeper understanding of how they relate to historic vessels, National Historic Ships UK has established the UK Replica List, covering those vessels built in the UK or abroad to a UK design, and defining the category of replication under which each vessel falls. The List provides an over-view for the purposes of research, public interest, filming, charters or crewing opportunities, as well as promoting the traditional skills involved in building and sailing these vessels.

CONSERVING HISTORIC VESSELS
H Cunliffe, National Historic Ships, UK
The guidance manual 'Conserving Historic Vessels', which forms the third volume of the series 'Understanding Historic Vessels' and was published in 2010, is the focus for this paper. It sets out the principles underlying conservation and the options available for historic vessels, emphasising the difference between the operational use or fabric 'conservation gateway', as well as the importance of deciding which of these conservation routes to adopt. The different conservation processes of preservation, restoration, reconstruction and adaptation are considered, with illustrated examples of each type in action. The importance of fully recording vessel conservation is underlined, and the need for research to be carried out so that each vessel's significance is fully understood. In addition to highlighting the terminologies applicable to historic vessel conservation and common misconceptions relating to this, the paper debates the impact of the conservation method adopted and the affect this may have on the success or failure of associated funding bids. Links are made with the National Historic Fleet and the case is made for prioritising the conservation of these vessels as key representatives of their type.
The paper concludes by summarising the ways in which National Historic Ships UK is now promulgating the standards set down in 'Conserving Historic Vessels', including the development of new accreditation and the increasing adoption of these principles and terminologies in Heritage Lottery Fund and other grant applications.

SUBMARINE ALLIANCE RESTORATION
W Davies, Wyn Davies 5201 Consultancy Ltd, UK
The Royal Navy Submarine Museum in Gosport UK owns and displays the last surviving WWII diesel powered submarine in the United Kingdom. When it was donated to the museum a means of display was selected to maximise on the limited space available at the museum. This was considered to be a very innovative approach with the submarine being mounted on two concrete plinths over the water at the museum quayside and between the quay and the marina next door. Whilst this had the advantage of being visually very impressive, it prevented unaided access to the external hull for regular maintenance and therefore the integrity of the external structure has degraded as a result. A paper was presented at the 9th Maritime Heritage Conference in 2010 outlining the steps taken to survey the hull, investigate potential solutions to recover the hull to a presentable fashion, compile a clear specification for contracting the work and to set out long term maintenance programme. This paper will pick up where the previous paper finished off. After the successful award of funds by the HLF, this paper examines the actual contracting process applied for the restoration of the submarine, outlines the current work in progress highlighting any unexpected problems that have arisen and how these impact the original restoration specification. This will allow the setting out of lessons learnt which could be useful to others contemplating a major restoration.

BRINGING OUR NAVY STORY ALIVE; UNIQUELY INSPIRATIONAL AND MOVING
K Jones, Portsmouth Historic Dockyard, UK
Portsmouth Historic Dockyard is the historic home of the Royal Navy and the current home of three of the most iconic warships ever built in the UK: the Tudor MARY ROSE, the Georgian HMS VICTORY and the Victorian HMS WARRIOR. The collective work that has gone into the conservation, restoration and continuing preservation and display of these ships have some interesting lessons for those with an interest in historic ships. The combined presentation will look at the particular issues that have had to be, and will need to be, addressed in the continuing preservation of these important ships and their artefacts:
a.MARY ROSE Trust's successful exercise in conservation of the ship and a treasure trove of artefacts, about to culminate in the opening of an exciting new museum, will be covered.
b.HMS Victory's recent change in governance has placed the ship under the care of the National Museum of the Royal Navy, and has allowed the development of a conservation-led approach to the ship's preservation and restoration.
c.HMS WARRIOR's philosophy of preservation, 25 yrs after an extensive restoration, will be explained.

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2, RINA HQ, London, UK

DAY 2 PAPERS INCLUDE:

STRUCTURAL ANALYSIS ON THE RIVETED HULL OF THE PADDLE STEAMER MEDWAY QUEEN

C Bailey, P Mason, S Stoyanov, P Rajaguru, University of Greenwich, UK
B Burton, B Barnes, L Crowder, R Stokes, Medway Queen Preservation Society, UK
W Davies, Wyn Davies 5201 Consultancy, UK

This paper presents modelling and FEA simulation studies and the associated stress analysis to the reconstruction of a historic riveted steel ship, Medway Queen. The objective of this study is to assess the longitudinal stress on the Medway Queen (MQ) hull under various sea conditions and load conditions. With this stress assessment detailed analysis in the localised riveted joint regions on the hull. This methodology for overall ship structural analysis will be realistic when considering the computational cost and set up time of the model. The beam element model represents the ship under hogging and sagging conditions with two wave heights is simulated. Four sets of live loads also added to the model to form sixteen simulation scenarios. From the longitudinal bending moment and shear force of all sixteen simulations, twenty extreme locations are identified and average stress on rivets of joints closed to these twenty locations are predicted. Stress values predicted are below the maximum permissible value of 100Nmm-2 specified by British standards BS153 and BS449. Hull plate test samples with various thicknesses of plates connected by various diameter rivet joints are tested in our tensile test machine to assess the rivet joint strength.

RESEARCHING, DESIGNATING AND MANAGING ENGLAND'S MARINE HISTORIC ENVIRONMENT

A James, English Heritage, UK

It is the role of the Designation Department at English Heritage, through a programme of strategic designation, to identify the important elements of our past and, in doing so, articulate how ship and boat remains contribute so thoroughly to our national story. Most recently, this has been achieved through the online publication Ships & Boats - prehistory to 1840. Ships and boats have defined our nation; from the migration of prehistoric populations, through the defeat of the Spanish Armada to the Allied invasion of Normandy. Ten years ago, the National Heritage Act 2002 transferred general functions for England's maritime archaeology to English Heritage from the Department for Culture, Media and Sport. At the same time, an 'ancient monument' was redefined to include the remains of vessels, aircraft and movable structures to exist in, on or under England's terriorial seabed. To date, 61 shipwrecks have legal status under The Protection of Wrecks Act 1973 ranging from the remains of Late Bronze Age cargo scatters to early 20th Century submarines. They have highlighted the research potential of shipwreck sites and illuminated diverse topics from early contacts with the Mediterranean through to the detailed understanding of a major Tudor warship. This paper will look at recent marine archaeological discoveries of sites that have been protected under the Protection of Wrecks Act and also look to the future for new approaches for site management.

S/T CHALLENGE - REPLACEMENT OF THE ORIGINAL BOILER

C Purser, Dunkirk Ship, UK

The smoke box and smoke box doors were seen to be in very poor condition and require extensive repair/replacement. A large percentage of the stay and plain smoke tubes were wasted at the ends where rolled and screwed into the tube plates and also corroded externally within the boiler. A number of stay bars within the boiler were badly corroded. Some of the shorter ones had failed. Initial thickness gauging showed that the combustion chamber tube plates were heavily wasted, particularly in way of the ligaments between the tubes, to the extent that they could no longer be safely exposed to the working pressure of the boiler without risk of cracking the combustion chamber top support strong backs together with the mounting studs were in a very poor condition. Cracking (together with evidence of past repairs) was found in the transition plates between the furnaces and the combustion chambers. Extensive localised deep pitting and more extensive overall corrosion had occurred along the full length of the lower shell of the boiler and into the rolled and riveted sections of the end plates, to the extent that it would no longer be safe to operate the boiler at its designed working pressure. As a consequence of the above findings, the existing boiler is to be scrapped and a specialist contractors approached to quote for the design and construction of a boiler

THE SS UNITED STATES - HULL & SUPERSTRUCTURE MATERIALS, THEIR GRADES, CONNECTION ISSUES AND CORROSION CONTROL

J Milligan, USA

The ocean liner SS United States was built in 1952 to the highest of specifications, being those of the US Navy as it was funded in the majority by the US Government. A major justification for its construction was that it could be readily converted to a troopship as the need arose. Having an LOA of 302 metres and a moulded beam of 31 metres she has a very fine length to breadth ratio. With this slender hull it could be said she would roll notwithstanding that she had fixed bilge keels but no deployable stabilizers. With this in mind, the designers, Gibbs & Cox of New York dictated aluminium for the Superstructure to reduce topside weight. This was the greatest use of this metal to that time in one project, over 2,000 tonnes, including the two funnels. It is well known that in a saltwater environment it is a challenge for steel and aluminium not only to exist but to co-exist.Where these two metals meet, the process is accelerated if they are not isolated from each other. To address these issues a great deal of research and testing of steel and aluminium grades, or 'cocktails' has been conducted over the years to develop a product that will resist these attacks. With regard to the interfacing of steel and aluminium this demanded a very time consuming and laborious installation process. This has now been eliminated with the introduction of newer technologies in the form of dissimilar materials bonded together using a special process.

ON NUMERICAL EVALUATION OF THE SAILING PERFORMANCE OF HISTORIC CLIPPER VESSELS

T Tilford, P J Mason, C Bailey, University of Greenwich, UK
E Kentley, Heritage consultant & J Harra, Julian Harrap Architects, UK

The sailing performance of historic clipper vessels is assessed using state-of-the-art numerical analysis techniques. The vessels studied are the Cutty Sark, built in 1869 by Scott & Linton of Dumbarton and the Thermopylae', built in 1868 by Walter Hood & Co of Aberdeen. These vessels famously raced each other between Shanghai and London in 1872. During the race, the Cutty Sark built up a commanding lead of approximately 400 miles over the Thermopylae before suffering a broken rudder. The time taken to repair the lost rudder cost the Cutty Sark the race, with the Thermopylae completing the journey in 122 days as opposed to the 129 of the Cutty Sark. The overall dimensions and prismatic coefficients of the two vessels are not particularly disparate yet historical documentation indicates that there may be a notable difference in sailing performance. This study sets out to determine if advanced computational fluid dynamics analysis will provide an indication as to the magnitude of any performance disparities and, ideally, indicate and design differences that contribute to any improvement in sailing performance. The results of these simulations can be used to construct a performance matrix correlating head way against prevailing conditions for each vessel. The matrix can be used to identify differences between the sailing performance of the vessels and can also be used to broadly recreate the historic 1872 race by correlating log book data on weather conditions to headway to formulate an overall estimate total race time for each vessel.

TECHNICAL DATABASE FOR THE AUTHENTIC REPLICATION OF TRADITIONAL NORTHERN & SOUTHERN CHINA SEA-GOING SAILING TRADING JUNKS

M Trimming, UK

The Paper addresses the primary sources of the extant historical & technical naval architecture knowledge-base for several traditional Northern & Southern China sea-going sailing trading Junks. Particular attention is focused on the sha ch'uan including a type-specimen naval architectural Hull Lines Plan extracted from authentic & reliable sources. The Paper reviews the current Archaeological wreck database of possible 'China-origin indigenous tradition' trading vessels excavated in the South China Sea / Southeast Asia areas. No original authentic China sea-going trading Junk has been preserved. China is currently once again a major shipbuilding nation with a leading role in the production of modern Bulk Carriers. Of interest to naval architects, nautical & ethnographical scholars, the paper presents persuasive technical rationale that the sha ch'uan design was a successful ancestral sea-going precursor to the modern Bulk Carrier. The Paper makes the case for the authentic replication, rather than the hypothetical reproduction, of key historic traditional Northern & Southern China seagoing sailing trading Junks based on a rigorous scientific application of the available historic technical database.

CHALLENGING FUTURE FOR THE HOVERCRAFT MUSEUM

B Russell, Hovercraft Society, UK

It is hard enough to cope with supporting a single historic ship, but the problem is significantly compounded if over seventy marine vehicles are involved, as is the case with the Hovercraft Museum. A small team of volunteers has not only raised the required funds, but have undertaken conservation projects and catalogued extensive archives. However, the future looks to have many challenges and opportunities. The site currently occupied is earmarked for development and although the Local Authorities support the continuation of the Hovercraft Museum, there is currently no actual allocation of space in the development plan. It is therefore likely that some downsizing will be required and attention given to the resources needed to move to an alternative site. Some of the hovercraft in the collection are undergoing major refurbishment programmes, whilst a few are maintained in operational condition. However, this has been a challenge as operational craft need to satisfy Maritime and Coastguard Agency requirements, which is both a drain on manpower and finances. A recent initiative has been implemented by the Tourism Section of the local Council, who are hoping to increase visitors to the area. Coupled with the Submarine Museum and Explosion! the Museum of Naval Firepower, plus the attraction of the Solent, the uniqueness of the Hovercraft Museum makes it an extremely mutually beneficial addition to any visit to the area.

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