The Royal Institution of Naval Architects

Historic Ships

International Conference

Historic Ships
7-8 December 2016,
RINA HQ, London, UK

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DAY 1 PAPERS:

09.00-09.30 COFFEE & REGISTRATION

09.30-10.05 ON THE APPLICATIONS OF MODERN NAVAL ARCHITECTURE TECHNIQUES TO HISTORICAL CRAFTS, *Jean-Baptiste R. G. SOUPPEZ, Southampton Solent University, UK.* The Thames A Rater class had a predominant role in the popularisation of inland racing in the United-Kingdom towards the end of the 19th century, and remains a historical racing class that owes its longevity to modern naval architecture and technology; the most emblematic example being the latest 43 feet tall carbon fibre rigs on the 27 feet centenary wooden hulls. Today, the Thames A Rater class is a perfect illustration of the balance between historical conservation and modernisation. The design of a modern wooden Thames A Rater will be presented, aiming at retaining the spirit of tradition of the class, while incorporating the latest design and production techniques, and complying with both the class rules and the RCD/ISO standards. As the Thames A Rater class rule requires the hull of any new design to be an original replica (within a 1.5 inch tolerance), the project started as an historical research to obtain an original linesplan; in this case a 1902 Linton Hope design, that was fully reproduced to ensure its conservation. Parametric optimisation was then applied to utilise the tolerance and reduce the hull resistance at high speeds while Computational Fluid Dynamics (CFD) modelling allowed to refine the centreboard and rudder design. The rig and sails were also investigated, a full stability assessment was performed, and a modern cold-moulding construction was proposed. Finally, a 6 degrees of freedom velocity prediction program was created to quantify the significant increase in performance achieved, thus demonstrating the applications of modern naval architecture techniques to historical crafts.

10.05-10.40 RMS MAURETANIA – DESIGN AND SIMULATION OF THE CUNARD'S 'ATLANTIC GREYHOUND', *Keith W Hutchinson, Babcock International Group - Energy and Marine Technology. Mel Irving, School of Marine Simulation and Senior Marine. Geoff Horseman, Siemens Power Generation Services. CA Parsons Works, Shields Road, Newcastle upon Tyne, United Kingdom.* This paper will discuss the design and development of Cunard Steamship Company's iconic steam turbine propelled transatlantic liner RMS Mauretania. Over a century after her construction at Wallsend on the River Tyne, her modelling on the Ship Simulator at South Shields Marine School, also on the River Tyne, will be discussed and illustrated. Mauretania together with her slightly older sister RMS Lusitania were the first of the giant transatlantic passenger liners designed with steam turbine propulsion with the intention of winning the Blue Riband, and were the only ships with direct-drive steam turbines to hold the Blue Riband, as later holders all utilised a reduction-geared steam turbines. This direct-drive configuration, used on all the giant passenger liners up to the mid 1920s, was that utilised a decade earlier in Mauretania's forebear the 1894 Tyne built 103 feet long experimental Steam Yacht Turbinia, designed by Sir Charles Parsons to demonstrate the superiority of his steam turbine for ship propulsion. SY Turbinia was the subject of a paper by the principal author to the previous Historic Ships conference held by the Royal Institution of Naval Architects in late 2014, and hence this paper will progress the story of steam turbine propulsion on into the first decade of the twentieth century through naval warships to the largest and most prestigious ships of their time, the transatlantic liners.

10.40-11.15 18 MINUTES - A FORENSIC ANALYSIS A TECHNICAL REAPPRAISAL OF THE SINKING OF RMS LUSITANIA, *Ian Winkle, UK.* When Kapitanleutnant Schweiger of U-20 fired a torpedo into the starboard side of RMS Lusitania on 7th May 2015, he set in train a sequence of flooding events leading to loss of the ship in 18 minutes, when 1198 passengers and crew perished. Using Glasgow University's Archive collection of original Lusitania design drawings and a transcript of the British Wreck Commissioner's Inquiry, this presentation attempts to uncover the flooding sequence and fundamental technical factors underlying each stage of the process together with actions which could have been taken to prevent her loss. The most significant would have been the enforced closure of all portholes in the third class accommodation in the forward half of the vessel, as ordered by Captain Turner earlier that day, but evidently thwarted by passengers in their cabins and dining area. This agrees with other analyses of the event. However, an overlooked design feature that played a major role in the final stage of flooding will also be highlighted. If more attention had been paid to the technical details of her loss at the official Inquiry (precluded by the Wreck Commissioner on grounds that his Titanic Inquiry had recently concluded the issue of passenger ship safety), Lusitania might have had a similar influence on future ship safety as her ill-fated competitor. As it was, it took another 45 years and two further losses of large passenger ships, for similar reasons, to address the most serious fundamental weakness of her design - the potential for asymmetric flooding.

11.15-11.45 COFFEE

11.45-12.20 ENGINEERING ANALYSIS OF THE S.S. OHIO, *Colin Bonnici, Claire De Marco Muscat-Fenech, Robert Ghirlando, University of Malta, Malta.* This paper describes the research undertaken to understand why the T2-tanker S.S. Ohio, which has become a legend of Maltese WWII history, survived the vicious bombardment to which she was subjected by enemy forces. On August 15th 1942, after her attack the tanker was towed to Malta, saving the islands from capitulation. Historical literature provides three hypotheses as to why the tanker did not sink under attack:- Auxiliary water pumps decreased the flooding rate,-Oil cargo being less dense than water prevented the ship from sinking, - A fully welded hull was strong enough to withstand the attack.The adopted methodology involves an analysis of the vessel's stability, floodable length and residual strength characteristics in the intact and damaged conditions. Results were then verified on a virtual 3D model. The analysis showed that the ship's stability was never compromised when damaged. The floodable length calculations indicated that the water pumps provided sufficient buoyancy to allow the tanker to reach Malta and the density of the oil cargo was not one of the variables which saved the S.S. Ohio. The residual strength results showed that the tanker was of adequate strength when intact yet was at risk of collapse with the first instances of damages. However, with further damage inflicted along the tanker's length, the vessel immersed on an even keel, reducing the bending moments amidships and the probability of breaking in half. The analysis shall serve as a gap closure within the historical field. Moreover the results will serve as a foundation for future investigations.

12.20-12.55 CAPSIZE OF SS 'DAPHNE' ON ITS LAUNCH, 3RD JULY 1883 - A TECHNICAL REAPPRAISAL, *Ian Winkle, UK.* Reviewing Sir Edward Reed's official Inquiry Report it was noted particularly that the actual launch process was discounted from Reed's analysis and conclusions at the time. The author challenges this assumption in the light of the testimony given in the Inquiry Report as well as the letters written at the time to Francis Elgar by Alexander Stephen (GU Archives), who provided additional technical details of the state of 'Daphne' at the time of her launch which included a large quantity of relatively heavy loose items on board which taken together would have a greater capsizing effect than the large number of men and boys present at the time, which Reed considered the primary cause. The presentation demonstrates that the capsize was the result of at least four contributory factors on top of the relatively low stability level present at the time. These include: an initial offset centre of gravity due to loading other than the result of the 195 individuals on board; a large initial heeling moment generated by the design of the drag and anchor system described; the subsequent movement of loose weights on the vessel as well as the movement of 195 personnel and their effects. Individually, none of these factors would have caused the capsize. However, the impact of this disaster had a profound effect on the industry through the introduction of systematic stability calculations on all commercial vessels made much more efficiently by the subsequent, universal introduction of the Amsler-Laffon Mechanical Integrator.

12.55-13.55 LUNCH

13.55-14.30 MEDIEVAL SHIPBUILDING ON THE ROMNEY MARSH: AN ALMOST FORGOTTEN ASPECT OF BRITISH SHIPBUILDING, *Fred. M. Walker.* During the fifteenth and sixteenth centuries, large sea going ships were built at Smallhythe – now a hamlet on the edge of the Romney Marsh. Probably 200 ships were constructed there in the same number of years including the great ship Jesus of 1,000 tons for Henry V in 1416 - then the second largest ship in England. The waterways around the Isle of Oxney have dried up but their positions are marked clearly by polder lands, and the marshes converted to sheep farming. Over a century ago Smallhythe lost access to the sea, and now the contact is the Cinque Port of Rye, eight miles south by road. This paper will examine the shipbuilding industry of five hundred years ago, and comment on the particular problems of retaining skilled labour and in obtaining high quality raw materials. Sixteenth century shipbuilding administration and practice will be discussed and the contemporary ships (carracks, galleasses, balingers etc) will be described briefly. Working in waters with a small range of tide and with little knowledge of ship theory was an added hindrance to efficient output. For some years, Smallhythe was arguably the largest commercial shipbuilding complex in the south: It played a useful role when the Royal Dockyards were expanding and forced Henry Vlll to become awake to the risks of an "arms race" with Scotland and other European countries.

14.30-15.05 CARAVELS, NAOS AND GALLEONS: SHIPS OF DISCOVERY, COLONIZATION AND CONQUEST. EXPERIMENTAL ARCHEOLOGY AND ANTHROPOLGY AS BRIDGES TO STUDY SHIPBUILDING, SAILING AND LIFE ON BOARD IN THE GOLDEN AGE OF SPANISH EMPIRE, *Esther M. García Vidal, University of Huelva, Spain.* The research focuses on the Maritime Spanish History, particularly in the Era of the Great Discoveries, Colonization and Conquest of America, which came to be called " Carrera de Indias " period limited between the XVI – XVIII centuries. And especially, in its Heritage, both tangible (artifacts) and intangible (mentefactos). Justification of this research is motivated by the desire of knowledge, but above all for the great changes that led to the scientific and technological developments, and thus the change in mentalities, which allowed a new worldview and new demands. The main Objective of my research is the ethnographic study of Maritime Heritage, Tangible and Intangible, for recovery with: a) Practical Purpose.- Recover to navigate (Experimental Archaeology).• Construction of réplicas.- Traditional Craft Recovery, as Carpentry, Ribera, netmaker, sailmaker, etc.• Sailing.- Recovery and knowledge of ancient navigation techniques. • Ethnographic study of life on board. b) Exhibition Purposes. • Recovery to exhibit in Museums. Survival of history. c) Publicity Purposes. • Recovery to transmit (research, media, ...), and to bring about changes and reactions in the public and political class. New legislation for protection. In this regard, it is important to highlight the importance of such initiatives replica building in the XX – XXI centuries, as its main objective has been researching part of our maritime history. This has allowed us to reveal many unknowns about one of the largest maritime feats of humanity, as was the Discovery of America, and subsequently the first round the world, both under the auspices of the crown of Castile. Not only on the technical aspects related to shipbuilding, but about astronomical sailing (importance of nautical instruments) , food and living on board, the importance of discipline and organization, ... In summary, the Maritime Heritage is a fragile heritage asset that must be protected, because through its study and research, we can not only analyze and determine how ships were built or how the sailors lived aboard them, but have knowledge of all the historical, economic, social and political context that developed in the period under study. Hence, it is very important that researchers publish their research and attend such events, because it is the only way to sensitize the political class and citizens.

15.05-15.35 COFFEE

15.35-16.10 EARLY RIVER FERRIES, Andrew D Moyse. As Europe developed it became necessary for wheeled vehicles and cattle to cross rivers to get to Market. Pole and sail propulsion had obvious limitations. Solutions to this problem were twofold: the energy of the River and Horses or Hay Burners.The latter were little used in Europe, but one was developed as a Tug for Chatham dockyard in 1630. They were used quite extensively on American Rivers in the 18th Century where some were built using as many as 8 horses, and they continued in use there till the early 1920s. The former type is still used on European Rivers and works like a pendulum by pivoting around a mid- river mooring, the rudder providing the transvers force to drive the craft across the River. A latter version used a mooring wire connected to a pulley on a single transverse high wire crossing the river. Nowadays these craft have added propulsion devices to increase the reliability in order to maintain a service. This forms the main part of this paper. Chain or wire Ferries develop in the early 19th Century of which there are still six in the UK.This type is briefly described. Such a vessel was recently built in Canada and another has been proposed for the River Thames. They are for special situations as increasing volumes of traffic necessitate bridges and so cause there demise.

16.10-16.45 TRANSITION, *B.A.Mooiman, Institution "Stichting Zr.Ms. Bonaire".* In 1876, Zr. Ms. screw steamship 4th class "Bonaire" was built by the Nederlandsche Stoomboot Maatschappij Fijenoord (Rotterdam) for the Koninklijke Nederlandsche Zeemagt (Royal Dutch Navy). She was a schoonerbark of 860 tons with steam power. The designer of the ship, Dr. B.J. Tideman (1834-1883) has in many ways made a mark on the Dutch, but also on the foreign shipbuilding. Shipyards had problems in the transition from wood to iron shipbuilding and from sailing to steam navigation. Through the introduction of new production methods as a result of his own scientific research Tideman has restored the confidence in the Dutch shipbuilding. He has recorded his experiences in the "Memorial of the Navy", a book that was leading in the international shipbuilding. This same Memorial is of indispensable value in the restoration of the Bonaire. Many drawings of warships, including the Bonaire are clearly recorded and described. "Bonaire" is a product of the important, interesting and rapid technical developments in the marine-shipbuilding around the second half of the 19th century: transition from sail to steam, transition from wood to iron, transition from muzzle loading guns to breach loading guns. Of all Dutch warships, built in the above technical-revolutionary period Zr.Ms. "Bonaire" is the only preserved example. Bonaire is an exponent of a very special period in the Navy ship building. Now she is, as far as the hull structure is concerned, even unique in the world!

16.45- GENERAL DISCUSSION & EVENING DRINKS RECEPTION

DAY 2 PAPERS:

09.00-09.30 **COFFEE AND REGISTRATION.**

09.30-10.05 **SHIPSHAPE HERITAGE TRAINING PARTNERSHIP (SHTP) PROJECT,** *Hannah Cunliffe, Policy & Project Manager, National Historic Ships UK.* This paper describes the Shipshape Heritage Training Partnership (SHTP) project, funded by the Heritage Lottery and set up in 2014 to develop traditional skills and techniques in young people, focusing on the conservation, handling and maintenance of historic vessels. National Historic Ships UK maintains the National Register of Historic Vessels listing over 1,200 craft in need of ongoing conservation. Many of these vessels remain in operation, yet the traditional skills and techniques of handling and maintaining them are in danger of being lost as those with the knowledge age. The SHTP project provided ten 12-month training placements at five partner sites ranging from Scotland to the West Country, offering on-board specialist training to ensure the significance of these craft and the ability to operate them safely and effectively is kept alive. The trainees also undertook a tailored course in historic vessel maintenance at the International Boatbuilding Training College and an interpretation placement at the Scottish Fisheries Museum. A skills mapping exercise has resulted in the development of a series of learning units and an assessment framework for seamanship skills. These will be published online and are intended to help ensure a more consistent approach to training delivery across the sector in future. This paper will review the SHTP project, highlight the traditional skills at risk of being lost, and feature case studies from the trainees and partner bodies we have worked with over the last two years, as well as explaining the outcomes which form the legacy of the scheme.

10.05-10.40 **PRESERVATION OF HMS VICTORY: PEST MANAGEMENT TECHNIQUES,** *Diana McCormack, National Museum of the Royal Navy, UK.* This paper will describe the building of a pest management strategy for HMS Victory, after issues encountered with wood-boring insects, including Death Watch beetle. This is crucial to the conservation of the ship, which is an extremely complex environment, and recognised as part of the national heritage. Various treatments were carried out and assessed including freezing, heat treatment (Thermo Lignum process) and the use of boron-based applications. Studies were carried out to measure the effectiveness of the various treatments in preventing re-infestation of historic fabric. The paper will discuss the long-term challenges of conservation, including factors such as control of environmental conditions within a historic ship in dry dock, providing access to the public as a visitor attraction, and balancing preservation against the ship's status as a commissioned Royal Navy vessel.

10.40-11.15 **THE BANTRY BOAT – THE CONSERVATION OF A UNIQUE HISTORIC VESSEL** *John Kearon, Retired former Head of Maritime and Land transport Conservation, National Museums Liverpool.* Most members of RINA will be aware of the successful Atlantic Challenge projects and of the associated sailing / pulling gigs, built internationally, some 70 in all to date. These elegant gigs are in fact replicas of a most fascinating vessel; the only surviving ships-boat from either the British or French Napoleonic period navies. Known as The Bantry Boat, she is an Admirals barge from the French frigate Resolue, of 1778, flagship of Rear-Admiral Neilly, and one of 45 ships that sailed from Brest in December 1796, with 12,000 soldiers, to invade Ireland, then England. However, the expedition was a failure. The barge was captured in a skirmish and taken to Bantry House, home of the leader of the local militia. There she stayed until 1944, when presented to the National Museum of Ireland (NMI). In 2006 the barge underwent a detailed programme of investigation and conservation at National Museums Liverpool (NML) on behalf of NMI, under the management of John Kearon, Head of Maritime and Transport Conservation, NML. The barge is now on display at NMI, Dublin, with some 95% of her original structure conserved, and with a surprising history uncovered, but never presented in public, until this opportunity, 220 years after her capture. The barge is located close to where Erskine Childers Asgard is displayed, which was featured in the RINA Historic Ships Conference in 2014.

11.15-11.45 **COFFEE**

11.45-12.20 **SALVAGE AT THE ENDS OF THE EARTH – THE ONGOING STORY OF THE VIOLA,** *Dr Robb Robinson - University of Hull, Captain John Simpson - Solis Marine Consultants.* The former steam trawler Dias (ex Viola) was built in 1906 at Beverley in East Yorkshire for the Hellyer Steam Fishing Company of Hull. Today, accompanied by the old whalers, she lies rusting at Grytviken, a deserted whaling station on the remote South Atlantic island of South Georgia, a short distance from the grave of Sir Ernest Shackleton. Throughout a career which encompassed almost the entire length of the long Atlantic, this little ship remained an everyday working vessel, just one of many apparently mundane, most certainly unsung, craft used by mariners of all persuasions to earn their living in a variety of ways across the world's wide oceans. Yet Viola's story is unique: a remarkable story of fisheries, whaling, sealing, war and exploration during which she both weathered and witnessed many aspects of mankind's twentieth century struggles on the sea. Viola was one of fifty or so trawlers built for the Hellyer Boxing Fleet in 1906. Later, requisitioned by the Admiralty, she was involved in the Great War at sea. By 1918 no less than twenty two of her sister vessels had been lost, to either the elements or enemy action in the Great War. Today, apart from this little ship, all physical trace of the once proud Hellyer fleet has disappeared. Viola/Dias is now the oldest surviving former steam trawler in the world with her steam engines still intact. This paper describes the colourful history of this vessel and the ongoing salvage project aimed at returning her to Hull almost 100 years after she set off to war.

12.20-12.55 **RESTORATION AND OPERATION OF A PIONEER LARGE DIESEL ENGINED YACHT,** *Dr Scott Pereira,Richard White.* The gentleman's motor yacht Lilian is celebrating its centenary this year. Built in Sweden for a Danish banker, Lilian was the largest vessel designed by the Swedish naval architect C G Pettersson. It was conceived as an ultra-modern vessel, and designed around a pair of the lightweight Polar type-Z diesel engines. Following a variety of owners, Lilian had become a stationary Sea Cadet training ship on the Thames when the current owners bought it in scrap condition. Restoration work created not only a permanent residence afloat for the owners but also a seagoing vessel crewed by family and friends that since 1988 has made long and short cruises most years ranging from Brittany to the Baltic. The paper will review the design features of this pioneering steel diesel powered yacht and its machinery with reference to surviving Pettersson detailed drawings. The process of restoration will be covered, including the reinstatement of much of the original interior panelling, furniture and fittings. Lilian's original engines and early mechanical reverse gearboxes survive, and powered the yacht until recently. They have been replaced in the short term by two modern engines while the Polar engines from 1916 undergo a thorough overhaul. In addition to reviewing the work of rebuilding this yacht, the paper will cover the challenges of maintenance, considering that the basic structure is now 100 years old with some of the restoration work in service for thirty years, and the choices between originality and operational reality.

12.55-13.55 **LUNCH**

13.55-14.30 **RECONSTRUCTION OF THE DESIGN AND PERFORMANCE OF THE ROYAL NAVY'S FIRST FRIGATE, HMS SOUTHAMPTON (1757),** *R C Braithwaite, Naval Design Partnership, UK.* The 1750's were a particularly interesting period in the history of British Naval Architecture. The lengthy period of stagnation imposed by a series of Admiralty "Establishments" was coming to an end. A significant example of the new ships introduced at this time was the 32 gun frigate designed by Thomas Slade (the Navy Board Surveyor who was also responsible for the introduction of the 74 gun ship and the design of HMS Victory) which became the predominant cruiser class in the latter part of the 18th century. HMS Southampton was the first of this class, often credited with being the first "true frigate" in the RN. This paper presents a reconstruction of the detailed design, of this historically important vessel. Reference is made to a range of contemporary sources and how these were used to provide evidence for the reconstructed drawings and specification. The resulting design definition was used to build a detailed weight estimate for the vessel so that a stability analysis could be carried out which enabled discussion of the implications on the vessels operation (and comparison with current UK criteria for sail training vessels). A simple velocity prediction model is also described that predicts HMS Southampton's performance in a number of conditions (wind strengths, headings and corresponding sail settings) and makes some comparisons with contemporary sea trial results. The relative performance of British and French frigates during this time is discussed with reference to the different requirements of the two nations.

14.30-15.05 **SUTTON HOO SHIP RECONSTRUCTION STUDY,** *Paul Handley.* An Anglo Saxon ship was found at Sutton Hoo in Suffolk in 1939 under a burial mound. The ship was almost 27m (90ft) long, of wood clinker construction, propelled by 40 oarsmen and estimated to date to 625AD. All of the original timber had decayed but an impression of the plank and frame surfaces was left in the ground and the iron rivets remained in place. The excavation was cut short by the onset of war and little recorded data survives except for detailed photographs of the ship impression and a provisional lines plan produced by the Science museum. In 1967 the site was re-excavated and further lines plans drawn, but by then the hull impression had been badly damaged. In 1993 a half-sized working replica of the ship was made and both rowed and sailed. In 2013 the Woodbridge Trust committed to building and testing a full size replica. This paper reviews the current research prior to the full-size reconstruction, including establishing the fundamental form of the ship by reviewing available historic information with consideration to possible distortion due to movement of ground, shrinkage and decay of timbers and likely units of measurements used based on measurement of Saxon buildings. From this research a computer hull model was generated and hydrostatic and stability software used to assess the likely displacement, loading and stability characteristics. Performance under oar power was assessed with consideration to effect of load and hull rocker.

15.05-15.35 **COFFEE**

15.35-16.10 **A DUTCH BOEIJER YACHT BROUGHT TO LIFE,** *Alexander de Vos.* In Warmond, the Netherlands, a traditional boatyard was reconstructed, using authentic materials and constructions. At this boatyard the 19th century boeier yacht 'Vivo' is being restored. Besides the restoration of this carvel build boeier, a project was started concerning the preceding type, the clincker build boeijer yachts. Although a number of carvel boeiers is still afloat, only ship models, pictures and drawings of clicker build boeijers remain. The research project aims at deepening the knowledge on this type of yacht in general and especially on the boeijer that was presented by the Dutch king Willem I to the Russian emperor Alexander I in 1816 on the occasion of the marriage of crown prince Willem II to the sister of the emperor, Anna Paulowna. The project combines historical research, e.g. in the archives of the Navy shipyard which built the boeijer for the emperor, with technical research of a number of admiralty models of the boeijer. Both traditional methods and modern techniques are used to investigate the lines and construction of the models. A purpose build measuring tool was used to transfer the shape of the stations onto paper. Furthermore a 3D laser scan was made and a CT-scan. An independent source of information are the drawings that were made from the real boeijer shortly before it was demolished in Leningrad in 1954. Next step is the investigation of the hydrostatic and hydrodynamic properties. A tempting follow-up is the reconstruction of the boeijer. This project is an initiative of the traditional boatyard Klaas Hennepoel and is supported by the Dutch National Maritime Museum (Mr. P. Rogaar Fellowship of Het Scheepvaartmuseum) and the heritage programme of the Provincie Zuid-Holland.

16.10-16.45 **DESIGN EVALUATION AND ALTERATION OF THE DARK HARBOUR 17.5: CASE STUDY OF A MODERN REPLICA,** *Luis G. ALESSIO, Southampton Solent University, UK. Jean-Baptiste R. G. SOUPPEZ, Southampton Solent University, UK.* Designed in 1908 by B. B. Crowninshield, the Dark Harbour 17.5 is a classic example of a traditional day sailor. A modern replica is currently being built at the IBTC Portsmouth, with the intention to develop into a commercial production. This modern replica calls for a number of design alterations, concessions of a traditional design to the modern world. An initial design evaluation was performed to assess the characteristic of the original yacht, in terms of hydrostatics, hydrodynamics, structural arrangement and comfort. Based on the owner's requirements, a number of modifications will be implemented. A shallower keel aims at increasing the area of operation of the craft and making it trailerable, while retaining performance and stability. To improve the strength and durability of the craft, a modern strip-planking sheathed with cold-moulded veneers has been chosen. The boat is also to be more comfortable and practical to use. Indeed, modern standards dictate the presence of additional comfort equipment as well as an electrical inboard engine. Finally, compliance with the relevant regulations will be checked to ensure the commercial viability of the craft. The new design can finally be compared to the original one, allowing to evaluate the challenges of design modernization, the impact of contemporary requirements on a traditional design and the suitability of modern replicas in today's market.

16.45- **GENERAL DISCUSSION**

International Conference

Historic Ships

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Cancellations received in writing two weeks before the event takes place will be subject to administration charge of £200+VAT. Cancellations received after this time cannot be accepted and are subject to the full event fee. Delegates may be substituted; however, this must be sent in writing and confirmed with the conference Co-ordinator. It may be necessary for reasons beyond our control to alter the content and timing of the programme. In the unlikely event that RINA cancels the event for any reason, our liability is limited to the return of the registration fee.

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Personal data is gathered in accordance with the Data Protection Act 1998. Your details may be passed to other companies who wish to communicate with you offers related to your business activities. Please tick the box below where appropriate:

☐ Please do not pass my information to any third party.

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If you have any questions regarding this or any other RINA event please contact, our Conference Organiser, on:

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