Workshop on SOLAS 2020 - Meeting the New Challenges -

9-12 October 2018
Glasgow, UK
INTRODUCTION

In January 2017, following recommendations from a number of EU-funded (SAFEDOR, GOALDS, EMSA I, II and III) and other research projects, the “safety level” for passenger ship damage stability has once again been raised to new heights, applicable to newbuildings that lay keel after January 2020. More recent findings from the Joint Industry-funded Project eSAFE, focusing on cruise ship damage stability, demonstrated the need for this type of vessel to become a separate focus to RoPax vessels when it comes to damage stability and proposed new formulations concerning both the input used in the calculations of damage survivability, as well as a new survival factor tailored to cruise ships. One might think that everything advances well and in the right direction, particularly as industry has now gained excellent understanding and experience in the use of probabilistic rules during the design process. However, many problems still remain and others are surfacing in the continuous quest for safety improvement in the maritime sector:

New Problems in the New Rules and the Way Forward:
The intention to provide a quantitative assessment of safety (a safety index) might have been enough at the time the probabilistic framework for damage stability was conceived (indeed for as recent as a few years ago) but this is not the case today. With the introduction of Design for Safety and of Risk-Based Design in the marine industry, quantification of safety is a prerequisite to treating safety as a design objective. This, in turn, entails that the level of detail in the method used to quantify safety carries a much bigger weight. With this in mind, calculating survival factors consistently and accurately is paramount. Unfortunately, a close scrutiny of the work that led to the current formulation of the s-factors revealed that it is simply the result of a series of unjustified compromises, which inadvertently crept in during the rule-making process. In the SOLAS 2009 formulation, the s-factor derives from a regression analysis of mostly a filtered set of old cargo ships. What is of crucial significance is that there is inconsistency between performance-based survivability and that postulated by the new rules. In addition, information used for input in calculating the new standard for survivability for cruise ships is different, leading to potentially wrong results and more importantly sub-optimally designed ships. Recent research projects (the EC-funded project GOALDS and the Joint Industry Project eSAFE) have addressed these problems leading to new recommendations and providing a way forward that will serve the industry in the interim; until cruise-ship specific SOLAS rules were adopted.
In this course, new results will be presented and the ensuing concepts clearly explained, focusing on the impact the current state of affairs might have.

**Old Ships and the Grandfather’s Clause:**
When it comes to RoRo passenger ships, this state of affairs is unjustifiably complex and in need of a rational solution, namely to eradicate the need for a modern passenger ship to be designed to two standards (potentially three with SOLAS 2020 coming into force), that is SOLAS 2009 and the Stockholm Agreement. The problem will hopefully be resolved with a new DG MOVE project, which aims to provide the reason and the evidence for rational decision making. Early results indicate that abandoning Stockholm Agreement will not be straightforward, particularly as this specific rule is applied retrospectively (thus any instrument substituting this should also be considered for retrospective application and that will be throw the spanner in the works); hence a different approach and solution will be necessary.

Explaining and demonstrating the relevance of each set of rules in this course will go a long way in resolving a problem that, in principle, should not exist.

**New Naval Architecture (from hull focus to total ship focus):**
With the advent of the new probabilistic rules comes a major shift in the way the fabric of Naval Architecture, namely floatability and stability, is being interpreted and used. The margin line disappears and Naval Architecture begins to delve into superstructure, seeking to identify and distribute watertight spaces so that floatability and stability are ensured in all the extreme damage scenarios covered by the probabilistic rules. However, consideration of upper decks for stability needs, would lead to accounting for all openings, escape routes, void spaces and layout; hence intruding into ship operation. In other words, safety, performance and functionality must now be considered concurrently through routine utilisation of optimisation techniques in early design stages.

Undoubtedly, the probabilistic concept of ship subdivision affords new degrees of freedom in ship subdivision and layout but, in this process, designers are finding it rather difficult to move away from the prescription mind-set. Adapting design practice to the new freedom, offered by the new rules, requires new skills, which cannot be based on experience alone. The need to facilitate better understanding of what this concept entails, its limitations and range of applicability requires continuous support for sustained improvement.
In this course, specific design examples will demonstrate the problems that might arise and the potential benefits that may be gained from a holistic approach to damage stability/survivability and ship design.

Risk-Based Design and Life-Cycle Risk-Management – A New Era in Naval Architecture:
SOLAS 2020 regulations are bringing to surface a new realisation, in particular raising the question as to whether modern ships can be designed to the very high safety standards expected by society today by using a limited set of “controls” to safeguard against potential catastrophic consequences of serious maritime accidents. In particular, subdivision bulkheads and similar “passive” design options to raising damage stability standards have by all accounts reached saturation. Safety affects everything and as a result it is affected by everything: process, people, technology, organisation, management, science and engineering. The problem currently facing the industry is that there is no way available to assign a risk measure to all these influences and hence to account for their contribution in ship design and operation. For this, much research will be needed to define a Life-Cycle Risk-Based regulatory framework; effort in this direction is already underway. What the industry already has, however, is the legislation on “Alternative Design and Arrangements”, which utilises equivalent-safety principles to provide a platform towards Life-Cycle Risk Management and to inculcate the maritime industry.

Application examples will be given in this course to provide the fuel to support discussion and facilitate understanding.

AIMS OF THE COURSE

Deriving from the above considerations, this course aims to provide:

- In-depth explanation of the theoretical background, nature and meaning of deterministic and probabilistic frameworks, regulations and criteria for damage stability and survivability assessment for all relevant ship types, with particular emphasis on RoPax and cruise ships.

- Demonstration through worked examples of the design implications deriving from the new rules and from using combined deterministic and probabilistic instruments.

- Elaboration of Risk-Based Design as a general methodology for supporting probabilistic frameworks for ship safety assessment and in particular, design optimisation for damage survivability using the new regulations for damage stability.
Hands-on experience on implementation of SOLAS 2020 to the design of representative RoPax and cruise ships using typical Naval Architecture CAD/Design tools and proven in-house software.

COURSE ORGANISERS

The Department of Naval Architecture, Ocean and Marine Engineering of the University is one of the largest and most research active in the marine sector worldwide with a history that goes back over one-and-a-quarter centuries. One of the prominent research groups in the Department, the world-first of its kind, the Maritime Safety Research Centre (MSRC), is a centre of excellence in partnership with Royal Caribbean Cruises and the largest Classification Society, DNV-GL. MSRC addresses all matters of safety and is responsible for conceptualising and promulgating to the maritime industry the new design paradigm “Design for Safety”.

EXPECTED BENEFITS

Future decisions concerning safety standards and safer ships will have to be shaped by scientific arguments because developments now happen faster than experience is gained. Applying SOLAS 2020 is a good example where fostering experience by using all available expertise is now a must. It is indeed vital that industry gains in-depth understanding of the theory and practical appliability of the new regulations for damage stability as well as appreciation of the level of safety offered by these regulations and the degrees of freedom implicit in the rules, particularly the alternative design and approaches. Equally as important is know-how in using this understanding to exploit the freedom offered by the probabilistic regulations to harness innovation and meet societal demand for higher safety standards cost-effectively. Drawing from considerable knowledge, expertise and experience, this course will address these needs, aiming to equip delegates with skills, which can be applied in the short- and medium-term to turn the challenges presented by the new regulations to exploitable opportunities in ship design and operation. The gap between research and application has now narrowed to the point where technology transfer and training can be most effective. The course material will provide ample back up and reference to “tools” and techniques of addressing damage stability and survivability whilst tutorials and hands-on examples will ensure that delegates will gain maximum immediate benefit.
COURSE PROGRAMME

Tuesday, 9 October 2018
(9:00 – 10:00; 10:00 – 11:15; 11:45 – 1:00) and (2:00 – 3:15; 3:45 – 5:00)

1. Regulatory Framework for Damage Stability
   1.1 Deterministic concept of ship subdivision (SOLAS 90 and Stockholm Agreement)
   1.2 Probabilistic concept of ship subdivision (SOLAS 2009)
   1.3 Probabilistic concept; introduction and background (SOLAS 2020)

Wednesday, 10 October 2018
(9:00 – 10:00; 10:00 – 11:15; 11:45 – 1:00) and (2:00 – 3:15; 3:45 – 5:00)

2. Probabilistic Framework of Damage Stability
   2.1 General probability theory
   2.2 p-factor
   2.3 s-factor

3. Probabilistic Framework of Damage Stability
   3.1 Design implications
   3.2 Design examples

Thursday, 11 October 2018
(9:00 – 10:30; 11:00 – 12:30) and (1:30 – 3:00; 3:30 – 5:00)

4. Hands-on workshop on design implications of SOLAS 2020

Friday, 12 October April 2018
(9:00 – 10:15; 10:45 – 12:00; 12:00 – 1:15)

5. Risk-Based Design
   5.1 Performance-based assessment of damage survivability
   5.2 Risk quantification and Safety Level
   5.3 Platform optimisation and worked examples
COURSE DETAILS

Organisation and Venue
The course will be organised and run by the MSRC and the department of Naval architecture, Ocean and Marine engineering. Lectures and hands-on application will take place at the premises of the University, Henry Dyer building, room HD113, 100 Montrose street, Glasgow G4 0LZ. Transport to / from the Centre will be daily available for delegates wishing to stay nearer the City Centre.

Participants
The course is expected to attract delegates from a broad spectrum of industries, including: designers, operators, regulatory authorities, surveyors, Government Administrations, classification societies, software developers, passenger ship operators, master mariners, young engineers, researchers and educators. The course has been designed to run for 25 participants maximum with places allocated on a first-come first-served basis. Repeat courses will be scheduled, subject to continuing demand.

Fee
The course fee is £1,500. This includes a set of lecture notes that will be sent in advance, following registration and payment of fees, lunch, coffee/tea and course dinner.

Accommodation
Accommodation should be arranged and paid directly by delegates.

Registration
Details about the registration can be found available on the MSRC’s web page:

www.strath.ac.uk/research/maritimesafetyresearchcentre

Registration closes on 10 September 2018. Delegates who cancel a booking before 10 September 2018 will have their fees refunded less 10% administration charge. The course fee will not be returnable for any cancellations made after this date.