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COVER NOTE

from:	Secretary-General of the European Commission, signed by Mr Jordi AYET PUIGARNAU, Director
date of receipt:	12 November 2012
to:	Mr Uwe CORSEPIUS, Secretary-General of the Council of the European Union
No Cion doc.:	SWD(2012) 378 final III
Subject:	COMMISSION STAFF WORKING DOCUMENT For the Council Shipping Working party IMO – Joint EU submission and related Commission submission concerning proposals to improve the SOLAS 2009 damage stability regulations for ro-ro passenger ships, to the 55th session of the Stability and Load Lines and Fishing Vessels Safety (SLF 55) meeting in London from 18-22 February 2013

Delegations will find attached Commission document SWD(2012) 378 final III.

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III

COMMISSION STAFF WORKING DOCUMENT

For the Council Shipping Working party

IMO - Joint EU submission and related Commission concerning proposals to improve the SOLAS 2009 damage stability regulations for ro-ro passenger ships to the 55th session of the Strability and Load Lines and Fishing Vessels Safety (SLF 55) meeting in London from 18-22 February 2013

SUB-COMMITTEE ON STABILITY AND LOAD LINES AND ON FISHING VESSELS SAFETY
55th session
Agenda item 7

SLF 55/INF.?
date
Original: ENGLISH

REVIEW OF DAMAGE STABILITY REGULATIONS FOR RO-RO PASSENGER SHIPS

Damage stability parameters of ro-ro passenger ships according to SOLAS 2009 amendments, including water on deck calculations

Submitted by the European Commission

SUMMARY

Executive summary:	This document introduces and describes the report of a second study commissioned by the European Maritime Safety Agency on the damage stability of ro-ro passenger ships according to the SOLAS 2009 amendments, including a water on deck calculation
Strategic direction:	5.1
High-level action:	5.1.1
Planned output:	5.1.1.5
Action to be taken:	Paragraph 24
Related documents:	SLF 53/INF.5; SLF 55/7/??; SLF 52/WP.3

Introduction

1. This document provides information on a second study, commissioned by the European Maritime Safety Agency (EMSA) at the request of the European Commission, on the specific damage stability parameters of ro-ro passenger ships according to SOLAS 2009 amendments including a water on deck calculation.

Background

2. MSC 84 agreed to include a new item on "Damage stability regulations for ro-ro passenger ships" in the Sub-Committee's work programme.

3. The Sub-Committee, at its 52nd session, discussed in detail the impact of the SOLAS 2009 amendments on the damage stability requirements for ro-ro passenger ships after the presentation of three research projects, and whether in this regard any amendment to SOLAS should be considered.

4. The Sub-Committee noted the general view of the SDS Working Group that more research and the evaluation of further studies were important and necessary before considering any possible additional measures. Following a request by the Sub-Committee, MSC 89 agreed to extend the target completion for this item to 2013.

5. The Sub-Committee at its 53rd session, instructed the SDS Correspondence Group to further consider the impact of the SOLAS 2009 amendments on ro-ro passenger ships, as compared to the SOLAS 1990 regulations in association with the Stockholm Agreement, taking into account document SLF 52/WP.3, and any research results in the matter as they become available.

First study commissioned by EMSA

6. In July 2009 the final report of the first study on ro-ro passenger ships[1], commissioned by the European Maritime Safety Agency (EMSA), was published. This study was carried out by the Hamburgische Schiffbau-Versuchsanstalt GmbH (HSVA) and concluded inter alia that "*in the framework of the new probabilistic damage stability rules (SOLAS 2009), it is possible to create ship designs with significant deficits in safety*" and that "*the ship stability required by the SOLAS 2009 rules is not likely to be sufficient in all cases*".

7. These conclusions were drawn from the model testing of two ro-ro passenger ships that were designed to meet the requirements of the SOLAS 2009 damage stability standard.

8. In the executive summary of the final report, the HSVA Consortium proposed to leave the damage stability rules in SOLAS 2009 in their present form and to develop an additional, separate Water-on-Deck (WOD) criterion for ro-ro passenger ships. Further information can be found in the final report which was made available to the members of the SDS Correspondence Group and may be downloaded from http://www.emsa.europa.eu/news-a-press-centre/external-news/weblink/21/1457/1.html.

Second study commissioned by EMSA

9. The objective of the second study, which was carried out by the Ship Stability Research Centre (SSRC) of the University of Strathclyde (UoS), was to propose possible amendments to the SOLAS 2009 damage stability requirements such that the effect of WOD on ro-ro passenger ships is taken into account and to identify any other potential damage stability issues.

10. More specifically the following research objectives were defined, to:

1 design five ro-ro passenger ships of different sizes according to SOLAS 2009 damage stability standards (and thereby catering for a wide variety in design, including small and large ships and ships with and without a long lower hold configuration);
2 perform a comprehensive survivability assessment of those five ships by means of numerical simulations and select three of the above vessels for primary tank testing. Out of these three, two would be later selected and re-designed for final tank testing;

[1] HSVA – Seakeeping and Manoeuvring Final Report Part I (Nº 1669) – Research for the Parameters of the Damage Stability Rules including the Calculation of Water on Deck of Ro-Ro Passenger Vessels, for the amendment of the Directives 2003/25/EC and 98/18/EC.

3 identify possible amendments to SOLAS 2009 that take into account the effect of WOD and other damage stability problems of ro-ro passenger ships based on the survivability assessment; and
4 test the possible solutions in order to demonstrate that the objective is met.

11. EMSA maintained continuous contact with the consultants and followed the work in detail. Nevertheless, additional technical expertise was enlisted and two experts were appointed by EMSA (from the UK's MCA and Finland's TRAFI). The experts also followed the study and, in particular, witnessed basin tests, which evaluated the new stability criteria proposed by the contractor.

12. During the study, five ro-ro passenger ship designs were developed according to the SOLAS 2009 rules. These designs were not marginal ones with respect to the limits set by the rules but were chosen as typical commercial designs suitable for the current market situation. UoS examined the damage survivability of the designs, including the effects of the accumulation of water on the vehicle deck. They then applied enhancements to three of the initial designs and assessed them for improvements to damage survivability.

Main findings and achievements:

13. SOLAS 2009 regulations were developed to take account of all factors underlying the loss of ship stability and to address all such deficiencies in a consistent and comprehensive manner. Accepted by Contracting Governments to SOLAS, including EU member States, it is the generally accepted measure of the ability of a ship to survive damage.

14. The study compared the requirements of SOLAS 2009 on the five selected ships with those of SOLAS 90 plus the Stockholm Agreement. The designs were used to examine the sensitivity of ship survivability - including the effects of the accumulation of water on the vehicle deck - to both regulatory frameworks (SOLAS 2009 and the Stockholm Agreement) and to propose design solutions for three of the initial designs. The survivability was assessed through a series of analytical studies, numerical simulations, and model experiments.

15. The first part of the study found that:

1 SOLAS 2009 ro-ro passenger ships have, on average, a lower ability to survive damage than those designed to SOLAS 90 plus the Stockholm Agreement;
2 SOLAS 90 plus the Stockholm Agreement also appeared to have limitations and may lead to ship designs that have some vulnerability when compared to SOLAS 2009 designs; and
3 the number of damage cases with no residual damage stability, meaning negative or zero GZ values, varied between 10 and 14% of all possible damage cases for the five ship designs. These damage cases were expected to lead to an unstable damage condition and capsize even in calm waters.

16. The next part of the study proposed changes to the SOLAS 2009 calculations that would ensure that the effect of water on deck is taken into account when it occurs on ro-ro passenger ships and also proposed raising the safety level further. In order to achieve this, and in view of the findings mentioned under paragraph 15, UoS proposed specific changes to SOLAS 2009, regarding s_i, w, k and R

17. Regarding the survivability formulation s_i, UoS proposed "*to adopt a conservative margin in assessing H_{crit} by modifying parameters […] to GZ_{max} = 0.25m and Range = 25deg, which would result in some 90% of all existing data to have been satisfactorily predicted"*

18. Regarding the weighting factor w, UoS suggested that assigning a probability to the draft of a vessel may lead to inaccurate estimation of the Attained Subdivision Index and therefore proposed to eliminate it from the current formulation.

19. With regards to the k factor, UoS proposed to dispose of it alongside an increase of R, since they observed that reducing the number of unsurvivable damage cases would lead to a decrease in the number of damage cases resulting in large angles of heel. More specifically, SHIP4 of the study demonstrated that when 'A_{DS}' was raised from 0.787 to 0.949 (calculated using the SOLAS 2009 formulation), the percentage of damage cases that had angles of heel of more than 15°, or were completely unstable, was reduced from 12.57% to 1.89%, while the percentage that had an angle of heel greater than 7° but lower than 15° decreased from 13.98% to 8.89%.

20. Finally, as regards 'R', the main principles of IMO's system of Formal Safety Assessment were used to assess the safety achieved by SOLAS 2009. The method calculates risk, and positions it within a framework of acceptability classified as "tolerable", "ALARP" ("As Low As Reasonably Practicable") or "intolerable". The ALARP category means that the risk is acceptable, provided it is reduced as low as reasonably practicable.

21. IMO Formal Safety Assessment Guidance places the boundary between the "ALARP" and "intolerable" categories at a position that the study correlated to a 1 in 20 year probability of there being an accident to a ro-ro passenger ship, across the worldwide fleet, involving 1000+ people. UoS argues that a 1 in 20 year boundary is too risky and is unlikely to be acceptable for the general public.

22. For study purposes, and drawing on examples from other sectors, UoS proposes a 1 in 100 year boundary instead. In this case, the risk of unsurvivable damage of SOLAS 2009 designs is well within the "intolerable" category. In principle, the action required is to enhance the standards of damage survivability to bring the risk within the ALARP region and then to ensure that the risk is reduced to "ALARP".

    1 The study demonstrated a compelling need to take measures to reduce the risk to "ALARP".
    2 The UoS questioned whether the boundary between the "ALARP" and "intolerable" regions should be changed to reflect a 1 in 100 year principle, in which case the risk would have to be reduced to bring it within the "ALARP" region irrespective of the normal criteria for "ALARP".

23. The interpretation of the "Reasonably Practical" part of "ALARP" is addressed by the Formal Safety Assessment process which was continued by conducting a cost-benefit analysis of proposed enhancements to the SOLAS 2009 standard. The study proposes changes to the SOLAS 2009 parameters and calculations to improve the ability of new ro-ro passenger ships to survive damage. Two of the original ship designs were chosen and design changes were made to meet the proposed enhanced SOLAS 2009 standard. The lifetime cost of those changes was estimated taking into account initial costs and the implications for operational costs. The two ship designs were subjected to analysis and

testing to demonstrate that their ability to survive damage had been significantly enhanced.

1 The study argues that the parameters and calculations of SOLAS 2009 can be enhanced to achieve a level of risk that is "As Low As Reasonably Practicable" ("ALARP").
2 The concept of freedom of design that was originally intended by SOLAS2009 would be maintained.
3 The study proposes an enhancement of the probability that is referred to as the "required subdivision index R" in the regulations that would then vary from 0.875 to 0.968. This can be considered an objective measure of ship safety and there would be no need to supplement this index by any deterministic requirements.
4 The UoS study cost data was drawn from the SAFEDOR[2] study to evaluate the "reasonable practicability" of enhanced target parameters and calculations of SOLAS 2009 that would reduce the risk of ro-ro passenger ships not surviving damage, to a point that may be regarded as "ALARP". Based on this data, the proposed increase of R was found to be cost-effective.

Action requested of the Sub-Committee

24. The Sub-Committee is invited to note the research commissioned by the European Maritime Safety Agency which is published under http://www.emsa.europa.eu/implementation-tasks/ship-safety-standards/92/1457.html, and to consider its findings within its work on the agenda item 7 "Revision of damage stability regulations for ro-ro passenger ships".

[2] The cost range assumed in the study had as a reference the SAFEDOR study, where it varied from 180,913$ to 344,173$. A conservative approach was used; an upper estimate of marginal costs of 500,000$ per 1% in increased value to attained subdivision index A was assumed.