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European Maritime Safety Agency
Att: Mr. Mikael Vartio

Swedish position on the Stockholm Agreement and SOLAS 2009 damage stability requirements

At the workshop on ro-ro passenger ships fitted with long lower holds held at EMSA on 17 November 2006 the future of the Stockholm Agreement (SA) implemented by directive 2003/25/EC was discussed. It was decided to establish a specific correspondence group to circulate MS data related to the combination of the SA with the new SOLAS Chapter II-1 damage stability regulations expected to enter into force on 1 January 2009.

In an e-mail circular 26 January 2007 EMSA requested MS to provide their opinion on the material circulated and on their overall position regarding this issue. The position of Sweden is presented in the following.

Summary

The SA is only related to the SOLAS 1990 damage stability standard and cannot legally be applied to new ro-ro passenger ships built to the new harmonized damage stability standard of SOLAS 2009. Available comparative studies between the requirements of SOLAS 1990+SA and SOLAS 2009 on existing ships show that the general level of safety is maintained by the new regulations. Further development of collision safety should be based on the more rational new regulatory framework.

Background to the Stockholm Agreement

Sweden has for a long time, both before and after the *ESTONIA* disaster, been active in the development of safety and efficiency of ro-ro passenger ships. These activities include fire safety and stability as well as other measures. Safe ro-ro passenger traffic has been and will continue to be of major importance for our people and industry. Our main objective has been to establish rational regulations through the IMO framework to be applied world wide. When a number of countries, including Sweden, after the *ESTONIA* realised the need for additional damage stability requirements for ro-ro passenger ships, we did not fully manage to push this all the way into the SOLAS convention, but we did manage to have a footnote to regulation II-1/8-1 inserted accepting regional requirements through Resolution 14 of the 1995 SOLAS Conference.

The result became the Stockholm Agreement which applies to ro-ro passenger ships operating on regular scheduled voyages between or to or from designated ports in North West Europe and the Baltic Sea. This agreement has today ten contracting parties and has been applied to new ships since 1997 and all existing ships since 2002. It has furthermore been enforced by all other MS through implementation of directive 2003/25/EC, for new ships from 2004 and for existing ships from 2010. We consider this as a significant improvement of ro-ro passenger ship safety compared to the basic SOLAS 1990 standard.

Formalities

Resolution 14 of the 1995 SOLAS Conference, allowed IMO members to conclude regional agreements if they considered prevailing sea conditions and other local conditions require specific stability requirements in a designated area. Res.14 is rather specific in its technical Annex, and refers directly to the deterministic damage conditions and stability criteria included in the SOLAS 1990 regulations.

“The Conference...

- 1. Agrees that two or more Contracting Governments may conclude agreements modifying the requirements of regulation II-1/8-1 in respect of every ro-ro passenger ship carrying passengers on regular scheduled voyages between designated ports in their territory, provided that these ships comply with safety requirements which are adequate in the opinion of these Governments for the voyage to be undertaken:*
- 2. Agrees also that, if these safety requirements include specific stability requirements, they should not exceed those specified in the Annex to the present resolution; ...”*

The footnote with reference to Res.14 is the foundation of the SA and other possible regional agreements. In our view it is from a legal point of view clear that additional regional requirements can only be applied to ships built according to SOLAS 1990 Chapter II-1.

The footnote reference to Res.14 is not included in the new SOLAS amendments nor are the regulations and conditions referred to in the resolution present in the new Chapter II-1. Thus, any new additional regional requirements to be applied to ships on top of the new Chapter II-1 should be approved by IMO.

If it is considered necessary to increase the survivability of certain ship types such as ro-ro passenger ships, this should be put forward IMO as a proposal for a new work programme item according to the procedures of the Organization. Such a proposal should include evidence of the compelling need as well as judgements of the benefits and consequences.

Background to the new SOLAS 2009 damage stability regulations

Sweden has also been active in the development of the new probabilistic damage stability requirements in SOLAS Chapter II-1. This work started several years before the *ESTONIA* disaster and was finalized through the adoption of Resolution MSC.194(80). The new regulations were developed under the SLF sub-committee and are based on significant research activities within the 4.5 M€EU-project HARDER.

This project developed new probability distributions based on damage statistics, new survivability criteria based on simulations and model tests as well as safety standards for dry cargo and passenger ships expressed as the required index R . Furthermore, some design studies on the implication of the new regulations were performed. A summary of the recommendations from the HARDER project can be found in the joint submission from Norway and UK, SLF 46/3/3, and a summary of the relation between the HARDER project activities and the development of new SOLAS Chapter II-1 can be found in the Norwegian submission MSC 79/11/5.

The probability distributions developed within HARDER were somewhat modified during intersessional discussions between MSC 79 and MSC 80. But the effect of these modifications was minor. See MSC 80/3/5 and MSC 80/3/11.

The survivability criteria proposed by HARDER included for the final stage of flooding one part which accounted for the effect of water on deck, "Static Equivalent Method" SEM, and one part based on a more traditional GZ -approach. The SEM criterion included considerations of the probability distribution of wave heights at the time of a collision (see SLF 45/3/3). In the evaluation of sample ships, the SEM was found to be almost negligible compared to the GZ -criterion on the results of the index A and also difficult to perform in a unified manner. The SDS Working Group under SLF 47 thus recommended to exclude SEM from the survivability criteria. See SLF 47/3/2, SLF 47/3/3, SLF 47/17 3.10 and SLF 47/WP.6.

This was accepted without further discussion at MSC 79 and MSC 80.

The assignment given by MSC for the development of harmonized regulations for both dry cargo and passenger ships, was to maintain the same level of safety as given by the existing regulations. Thus, the required index R was evaluated by regression analysis from calculated attained index A for a number of existing ships representing the world fleet. So, very generally speaking, about 50% of all ships tested would have more strict requirements with the new regulations and about 50% would have less strict requirements. That was the general concept agreed.

However, the concept of maintaining average safety was not kept for two specific types of ships, ro-ro cargo ships with large open decks and large passenger ships. The reason for this was that existing ships of these types were in the evaluation found to be (in average) on a much lower level of safety compared to other ship types. MSC 78 explicitly allowed the standard to be raised for these types of ships in order to have common requirements i.e. only one R -formula for cargo ships and one for passenger ships (MSC 78/26 12.8).

Finally, after extensive debate during many SLF and MSC sessions the new regulations were adopted as Resolution MSC.194(80). EU MS and Associates have been driving parties in this long discussion and development and as far as we know no one has put forward its reservation regarding the outcome in terms of safety standard.

The issue of safety comparisons

When dealing with probabilistic requirements we have to accept that certain conditions might have less survivability and that this is compensated by other conditions giving a better survivability. If the probability distributions for damage position and extent are reflecting reality, this concept is rational in terms of overall safety.

In the existing SOLAS 1990 deterministic approach for passenger ships we assure survivability for specific conditions (limited to a penetration of less than $B/5$ and normally to two compartments), but do not bother at all about the other possible conditions. From a layman point of view this may be more easy or be perceived more clear, but it cannot be considered more rational. On the contrary, the evaluation process performed as basis for the new regulations showed that passenger ships designed to comply with SOLAS 1990, had a very large scatter in safety. Even the basic objectives of having a higher standard for large ships and large number of passengers were not fulfilled in the samples studied.

Sweden has performed a comparative study in which we have evaluated eight existing ro-ro passenger ships under our flag with regard to the new SOLAS 2009. All of these ships fulfil the SA. Three of them have in addition been evaluated as they were before being rebuilt to comply with SA. The results from this study showed:

- The new SOLAS 2009 requirements would be more strict than SOLAS 1990 + SA for 6 and less strict for 3 out of 9 evaluated ships and conditions.
- The measures applied to existing ships in order to fulfil SA, were also very effective for increasing the attained index A .
- The variation of the ratio $R_{\text{new}}/A_{\text{SA}}$ was found to be significant with a range between 0.83 and 1.36, and with a mean value of 1.04

To us this clearly demonstrate that the safety standard of SOLAS 1990 + SA is not consistent and that the new regulations in average would achieve an equal or even slightly higher safety standard for the ships investigated.

Germany has performed a similar study on one existing ro-ro passenger ship and one design from the Safedor project. $R_{\text{new}}/A_{\text{SA}}$ for these two samples are both 1.01.

UK shows in their presentation results from four ships evaluated at SSRC. Although we have not been able to see any details of these ships, the presented results show that all of them would have a lower R than the actual A . The average ratio $R_{\text{new}}/A_{\text{SA}}$ for this sample being 0.94.

If we take the mean ratio of all of these 15 investigated ships and conditions, it becomes 1.01. So still, with the concept of equivalent safety used within the HARDER project and agreed at MSC, the safety level for these ships would in average be equal if they were evaluated with the new regulations. On top of that the new regulations include additional deterministic requirements for minor side damage and for bottom damage.

Arguments that the new requirements are less strict than the previous are not fair if they are based on a comparison for specific ships and specific conditions. This deterministic concept has been left on purpose because it is less rational. The variation in attained index found in the evaluation of existing ro-ro passenger ships designed for SOLAS 1990 + SA shows just that. The old deterministic requirements do not adequately address the safety considering all possible conditions.

Further development of ro-ro passenger ship safety with regard to collision accidents

Sweden is in favour of continuing proactive measures in order to increase the safety of ro-ro passenger ships as well as other types of ships. With regard to collision such measures should fit into a rational approach which could be summarized by the following four steps:

1. the probability of a collision occurring,
2. the probability of damage position and extent after a collision,
3. the probability of survival after a damage,
4. the overall level of safety to be applied in regulations.

Step 2-4 are explicitly included and quantified in the new Chapter II-1 of SOLAS 2009 by the formulae of p , s and R . Step 1 is implicitly guided by other regulations such as SOLAS Chapter V, STCW, routing measures etc. but has not yet been quantified in the regulations.

The SA deals specifically with step 3. If the approved new description of survivability is shown to be less adequate for specific ship types, we certainly will support further development to make it more physically correct and robust. We are also in favour of a continuous review of the safety level expressed as the required index R . However, applying SA in its present form on top of these four steps would, in our opinion and based on existing knowledge, neither be rational nor the most effective way of increasing safety.

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