

Rationalizing the Practice of Probabilistic Damage Stability Calculations

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Abstract

An introduction is given concerning the probabilistic damage stability method as presently used in daily shipbuilding practice. In this respect some problem areas are described which may lead to difficulties in applying the method, both in actual point design and in design optimisation. These problem areas primarily relate to the bookkeeping at multicompartiment damages in combination with both longitudinal and horizontal subdivision (i.e. limited penetration problem). Secondly, ambiguities that arise through naming conventions are discussed. After a detailed description and analysis of these problems, suggestions are formulated regarding possible solutions. In case where a real solution is lacking, workarounds are put forward as being (for the time being) makeshifts. These solutions or workarounds fully fit within the theoretical background of the present regulations as laid down in the SOLAS convention; they affect mainly interpretations and definitions. Numerical examples applied to two existing new building container vessels are given and the results using the conventional method are compared with those using the various proposed solutions. In these examples it appears that the sum of all probabilities of damage do not tend to reach to the expected value of unity, a phenomenon which indicates a theoretically incorrect behaviour. Finally, conclusions are made regarding these results and recommendations related to the probabilistic damage stability calculation method and statistical approach used therein are made. Furthermore a possible method is brought forward that may be used in combination with tools for optimisation of the subdivision of a newbuilding design with respect to probabilistic damage stability characteristics.

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