

Contribution ID: 9

Type: Paper

Surf-riding/broaching failure mode within IMO SGISC framework

Friday, 17 June 2022 14:35 (20 minutes)

The International Maritime Organization has formally approved, as recommended guidelines, the methods and procedures of the Second Generation Intact Stability Criteria (SGISC). These criteria introduce the concept of dynamic stability in the intact stability assessment of ships and define the failure modes that might occur to a ship that navigates in harsh sea conditions. This paper focuses on surf-riding and broaching phenomena in stern-quartering seas, with the objective of analyzing the characteristics and the potential of SGISC risk assessment in the ship design.

The risk-evaluation criteria of surf-riding and broaching were followed through Level 1, Level 2 and Direct assessment of SGISC. Two different hull designs were considered, a fast displacement ship and a high-speed V-bottom, hard chine hull. Time domain simulations were performed using a time domain potential flow boundary element method. A detailed definition of broaching was used to detect the event occurrence in irregular waves, and the results were compared with failure mode definition of SGISC concerning the roll and lateral acceleration safe limits exceedance. The SGISC were also employed in the attempt to evaluate the different failure mode risk assessment due to different stern appendages configurations of the two hull designs with respect to broaching and surf-riding.

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Session Classification: 7A

Track Classification: Stability, Seakeeping, Maneuverability