

Capsizing of Ships: Static and Dynamic Analysis of Wind Effect and Costs Implications

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The capsizing of small vessels such as commercial fishing vessels is a frequent event. This phenomenon is generally associated with the combined action of storm seas, inadequate design parameter regulations, and dangerous operation procedures. In contrast, the capsizing of large ships is rare, but does occur. For large vessels, stringent regulations exist to ensure safe design and operational procedures. While the storminess of the sea cannot be controlled, the navigation procedure can. For example, large offshore ships tend to alter course to avoid forecasted severe weather. In cases when stormy seas cannot be avoided, large ships temporarily operate at safe speeds and travel on a course parallel to the direction of the waves.

The work presented in this thesis investigates the effect of the wind in the rolling and capsizing of a ship. For the purposes of mechanical analyses, realistic hull forms are used and the associated moments and forces imposed by the wind are applied for both static and dynamic cases. The platforms are examined at several wind speeds that strike the ship at different angles. The heel angles and wind speeds that cause the capsize of each ship are calculated.

A cost analysis associated with the total loss of the ship due to capsize is also reviewed. An existing worldwide database of vessel total losses, dating from 1960 to present, is used to calculate the costs per ship capsize. Some simplifications are inevitably used because cost implication due to total losses of ships have both direct and indirect portions that are difficult to quantify. In addition, the actual numbers that result from such a catastrophe are not generally available to the public and are not found in open literature. Given these limitations, a preliminary analysis of the capsize-associated costs is performed for several types of commercial vessels.