Development of an Emergency Trip System in Response to a Ride Control System FMEA

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Abstract

Ride Control Systems (RCS) are routinely fitted to high-speed vessels. RCS offer improvements in performance and ride quality for such vessels. Because these systems are designed to generate large forces to positively influence vessel motions under normal operations, they can also produce undesirable motions when they malfunction. Accordingly, regulatory bodies typically require that such systems be included in the Failure Modes and Effect Analysis (FMEA).

A focused FMEA for a high-speed monohull fitted with a RCS consisting of an automatic control system and a pair of transom mounted trim tabs was performed. Inadvertent deployment of a single trim tab was identified as possibly producing a hazardous effect.

Because operator action alone may not produce timely corrective action to inadvertent deployment of a single trim tab, a backup system was investigated using data obtained from model-scale tests. An Emergency Trip System (ETS) based upon transverse acceleration, roll, and yaw rate was developed that signals an emergency stow of the tabs. The algorithm was designed to be able to differentiate between normal vessel responses to aggressive maneuvers such as a hard over turn at maximum vessel speed and undesirable vessel responses to inadvertent operations of a trim tab.

References

“Rules for Classification of High Speed, Light Craft and Naval Surface Craft, Det Norske Veritas, Part 0 Chapter 4 (including relevant amendments and corrections from the January 2006 version of Part 0 Chapter 1 Section 3), 2006.