Title: **Low Noise Motion Measurements & Accuracy Transformation of Acceleration Over Long Lever Arms on Large Vessels – Method, Test, Results and Opportunities**

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Abstract

Manual or automated operations rely on precise and reliable motion measurements. Operations can be improved and the operational window for the operation can be extended by better utilization of such measurements. Operations can potentially be performed in rougher weather conditions than earlier without exceeding safety margins.

Acceleration measurements are important in order to determine forces (Force=Mass*Acceleration) acting on critical points in a system, like modules or humans on deck. Better operational control and better control of safety levels is achieved with availability of acceleration data.

This paper presents a new method for transformation of acceleration over longer distances on a rigid body. Traditionally a number of accelerometers or motion sensors have to be mounted close to any point where acceleration is needed on board a vessel. This is not always feasible and might also be prohibitive due to cost considerations. The new method offers a much better utilization of high precision motion sensors. This also opens for establishing new operational procedures to increase efficiency and improve safety.

Results from an operating vessel verify the improvement of the new method compared with traditional methods. These data and results are presented and analyzed in the paper.

The new method can be utilized on a single vessel by generating alarms when acceleration limits are exceeded. Today operational constraints usually are derived from numerical simulation of vessel responses based on input of environmental conditions. Accurate transformation of acceleration to the points critical to the operation will represent a direct measurement of the vessel motion and provide an excellent supplement to the constraints derived from the environmental conditions.

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