

Non-Linear Rolling of Ships in Large Sea Waves

by
Scott M. Vanden Berg

Submitted to the Department of Mechanical Engineering on May 12, 2006 in
Partial Fulfillment of the Requirements for the Degrees of
Master of Science in Ocean Engineering
and
Master of Science in Mechanical Engineering

ABSTRACT

The United States Navy has taken a new interest in tumblehome hulls. While the stealth characteristics of these hull forms make them attractive to the Navy, their sea keeping characteristics have proven to be problematic. Normal approximations of sea keeping characteristics using linear differential equations with constant coefficients predict a very stable platform, while observations in model tests show a ship that is prone to extreme roll transients. This thesis examines a simple method of producing a non-linear simulation of roll motion using a tumblehome hull provided by the Office of Naval Research. This research demonstrates the significant difference that a variable restoring coefficient introduces into a hull's seakeeping characteristics.

Thesis Advisor: Jerome H. Milgram
Title: Professor of Mechanical Engineering

Thesis Reader: Joel P. Harbour
Title: Associate Professor of the Practice