A FREQUENCY DOMAIN STRIP THEORY

APPLIED TO THE SEAKEEPING OF THE ZUMWALT-CLASS DESTROYER

by

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## ABSTRACT

Seakeeping analysis of the Zumwalt-Class destroyer was carried out in the framework of linear strip theory and potential flow. First, the problem was formulated and solved analytically. Second, a program called Ship Motions Analyzer (SMA) was written in MATLAB™ to carry out the seakeeping analysis for regular waves in a discretized frequency range. SMA calculates sectional added mass and damping coefficients first. Then, it calculates excitation forces and moments acting on a ship advancing at constant forward speed with arbitrary heading for sway, heave, roll, pitch and yaw modes of motion. Finally, SMA evaluates Response Amplitude Operators (RAO's) in the same modes of motion. In addition, it also includes a subroutine which evaluates steady drift forces acting on a ship in the plane of undisturbed free surface.

The added mass and damping coefficients of a fully submerged heaving circle and a semi-circle in heave and sway were calculated to validate the results of SMA. The results were compared to the results of Vugst [1] and Frank [2]. They match each other exactly. In addition, the magnitudes of heave and pitch excitation force and moment, and RAO's in the same modes of motions were calculated. The results agree with the theory. Finally, added resistance of Mariner type ship was calculated by SMA to compare the results to the ones given by Salvasen [3] and to validate the calculations. These results are also in very good agreement with the available computational and experimental results.

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