NAVAL POSTGRADUATE SCHOOL
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PARAMETRICS OF NEAR SURFACE RESPONSE OF SUBMERSIBLE VEHICLES

by

A. Kaan Çelikel

September, 1996

Thesis Advisor: Fotis A. Papoulias

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B.S., Turkish Naval Academy - 1989

Vertical plane response of submersible vehicles in the proximity of a free surface in deep water is evaluated using a potential flow, strip theory solver. Two criteria, that are periscope submergence, and sail broaching are used to quantify the response. These criteria combined with the vehicle's response amplitude operators in regular sinusoidal waves along with a statistical description of the seaway lead to an assessment of an overall operability index for the vehicle. This thesis presents a systematic parametric study of the effects of body geometry on near surface response. Two cases, namely limited diameter and limited length are considered. The total volume of the vehicle is kept constant, and certain shape factors are changed, while either the overall diameter or the overall length remains the same. The operability index is calculated for each case within a given range for sea states and sea directions and for various shape factors, vehicle speeds and operating depths. The results indicate that certain changes of shape factors can improve vehicle operations in various depth and speed combinations.

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