Course Stability of a Towed Submarine Rescue Vehicle

A manoeuvre-based approach

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ABSTRACT

Submarines are seldom directionally stable while being towed by a surface vessel at lower speeds. The Swedish navy’s submarine rescue vehicle URF, for example, is directionally unstable when being towed by a surface vessel in the range of 3 to 7 knots. An experimental evaluation was conducted to assess the effect of static trim angle on URF’s course stability; by adjusting URF’s trim angle, the center of pressure can be shifted in a way that is favourable to course stability. A 1:19 scale model was towed in calm water at equivalent full-scale speeds of 2 to 8 knots and at trim angles between 0 and 15 degrees. Stability and safety were assessed on the basis of the model’s observed behaviour during towing, including the model’s maximum angle during wandering, stable angle, tendency to dive and behaviour upon sudden release of the towline.

1 INTRODUCTION

1.1 The submarine rescue vehicle URF

The crews of submerged disabled submarine face a hard predicament; there are only two routes for survival: escape or rescue. Even today the chances of surviving a submarine accident by either method are generally poor, and largely dependent on circumstance, as illustrated by the Kursk disaster in August 2000; however, successful attempts at both have been made for over a century. While improvements to submarine escape and ascent devices have been under constant improvement since 1911 when they were first used successfully to evacuate