UNIVERSITI TEKNOLOGI MARA

COMPARATIVE STUDY OF DRAG AND LIFT FORCE FOR DIFFERENT SHAPES OF SUBMARINES

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ABSTRACT

The optimal hydrodynamic form of a submarine's bow in terms of least resistance is discussed in this study. The hydrodynamic shape of submarines may be divided into two categories: the shape of a teardrop and a central body that is cylindrical. This study focuses on submarines with parallel (cylindrical) middle bodies because the bulk of naval submarines and ROVs have cylindrical middle bodies. Every hull has three parts: the bow, the cylinder, and the stern. This analysis does not include a conning tower (a sail)or any additional appendages. The goal of this work is to use the CFD approach and Flow Vision software to propose an optimal bow design. Resistance and the noise field (flow noise surrounding the sonar and acoustic sensors) are crucial elements in the hydrodynamic design of a military submarine's bow. The focus of this work is resistance in a fully immersed mode without free surface effects. The impact of these layout elements on the bow form is first investigated inside the bow of a navy submarine. Second, to better understand the foundations of bow design, examples of usage in historically significant naval submarines exhibit all possible shapes for submarine bow shapes. Finally, CFD analysis has been performed on all forms. These characteristics are constant in all models, except for the bow shape: diameter, stern form, and overall length; velocity, domain dimensions, and subsurface dimensions; (bow, middle and stern length)

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CHAPTER 1 INTRODUCTION

1.1 Background of the study

There are various guidelines and concepts to follow while designing submarines and submersibles. Understanding the foundations and concepts of shape design is critical. The shape of a submarine is entirely dependent on hydrodynamics, just like other maritime vehicles and ships. Due to the limited energy available to submarines during underwater navigation, the lowest resistance is critical in submarine hydrodynamic design.

Furthermore, the shape design is influenced by the submarine's interior architecture and overall layout. Convergence of hydrodynamic and architectural requirements is critical in determining the overall shape design of a submarine. Pressure hulls and light hulls are the two subcategories of submarine hulls. A pressure hull offers a dry environment in the atmosphere for life, electricity, and other equipment that are sensitive to humidity and high pressures. Electronics that can endure the pressure of the ocean's depth can be wetted in the light hull. Submarines may navigate in two modes: surfaced mode and submerged mode.

The energy source constraint in the surfaced form of navigation is lower than in the immerse mode. As a result, in true naval submarines, the submerged mode is used to determine the hull form. The hydrodynamic shape of submarines can be divided into two categories: body shape in the form of a teardrop and a cylindrical middle. This study focuses on submarines with parallel (cylindrical) middle bodies because cylindrical middle bodies are the norm for navy submarines and ROVs.