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PHOTO ANALYSES OF A FULLY SUBMERGED STATIC VEHICLES ON DIFFERENT WATER VELOCITY

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ABSTRACT

This project demonstrates the hydrodynamic state of a stationary vehicle submerged in a moving water channel. Recent study uses the Wind Tunnel machine in order to find the lift and drag forces. However, a Circulating Water Channel can also be used. The concepts are quite similar but the CWC machine uses the concept of fluid dynamics. The objectives of this study are to determine the flow pattern of fully submerged model of sports car, ambulance, a jeep in different water velocity that is fully submerged underwater and to analyse the effect of lift and drag force on different vehicle models on flow pattern that formed. The experiments will be carried out using the Circulating Water Channel machine (CWC) under four Submerged Ratio (SR) conditions, such as the height of the pitot tube from the bottom, suggesting that the water pressure and flow velocity varied. A Digital Single-Lens Reflect (DSLR) Camera will be used to capture of flow pattern of water during around the vehicle models during the experiment. Then, in order to compare the three objects, the difference in pressure and flow results will be observed. The influence of flow pattern on three vehicles models are investigated. Then the drag and lift force will be calculated it is expected that a better aerodynamic shape will result to a better lift and drag forces.

CHAPTER ONE

INTRODUCTION

1.1 Background of Study

Water is a vital component that possesses a great deal of strength, to the point where it is even able to propel vehicles when operating at the lowest possible hydraulic settings. The manner in which floodwaters exert their influence and control on a vehicle is influenced by the flow orientation of the water as well as the vehicle's geometry and physical qualities. A non-stationary vehicle that is partially submerged and moving forward while attempting to traverse a roadway that is flooded has been the subject of an investigation in this paper to explore the hydrodynamic impact (flat conditions). For the purpose of determining these results, comprehensive experimental testing was performed on a city automobile manufactured in Malaysia called the Perodua Viva (1:10). During these tests, the vehicle was made to be partially submerged while being subjected to the influence of subcritical flows.(Shah et al., 2020) Car designs and roadway conditions evolved towards improvement with time, thus variety of vehicle dimensions have been tested in recent years to further explore the instability criteria of modern cars in floodwaters.

On urban floodplains, a car can float, slide, or roll due to moving water, particularly floodwaters. Vehicles in floodwater flows must be characterised by their stability thresholds, which can be characterised by the relevant forces involved in this phenomenon, such as friction, rolling friction, normal reaction force, and the vertical uplift force, all of which are related to the vehicle's Buoyancy (F_B) and lift force (F_L), Drag ($F_{D)}$ in the direction of incoming flow, Drag in the direction of vehicle movement, and the driving force generated by the vehicle's engine, all of which are perpendicular to each other.(Shah et al., 2020)

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