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MEC299

**RESISTANCE PREDICTION OF GRP  
BEDAR IN CALM WATER USING  
COMPUTATIONAL FLUID DYNAMIC  
APPROACH**

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## CHAPTER 1 INTRODUCTION

### 1.1 Background of Study

The term bedar, (in Terengganu spelled “bedor”), is applied to a wide variety of boats of the east coast of Malaysia that carry one or two junk sails and lack the typical transom stern of the perahu pinas. These junks rigged boats are usually built in Terengganu area. This type of boat is said to be an original Malay boat especially in terms of its shape. The upper part of the bow and back is mounted a piece of board protruding forward and backward as if the snout of a duck usually longer than the back. Apart from the hood at the back, in the middle of the hull of this boat there is a building known as “Jerombong”. The space below it is space filling stuff. The boat measures ten meters to sixteen meters and is about a width three meters. The loading rate of goods is estimated at around 350 to 400 pickups. The boat is propelled using three sails. The speed of this boat when sailing between 6 to 7 knots per hour.

So, for this project, something different using this bedar boat will be changed, which is called bedar fiberglass (potong belakang)." Before this, changes will occur to the engine only, but this boat is made of “cengal” wood, which is this wood are quite expensive since now. Therefore, converting wood to fiberglass is a pretty good solution because of its cheaper price as well as its higher durability. For the engine part, replacing the ship's sail with a Yamaha or Mercury outboard engine is the best way to produce a good speed because a motor yacht gives an easier ride, with the engine doing all the hard work. Handling sails and rigging is physical work and might not be for everyone. If you love to sail, a sailing boat is a no brainer. For a more relaxed, less physically demanding ride, a motor yacht is a better choice. For the design of the boat, Polycad and Computational Fluid Dynamics (CFD) were used to simulate marine conditions and predict the flow of air and water around a ship.

The analysis of fluid flows using numerical solution techniques is known as computational fluid dynamics (CFD). It will evaluate complicated issues involving fluid, fluid-solid, or fluid-gas interaction using CFD. Aerodynamics and hydrodynamics are two engineering disciplines where CFD analyses are routinely used to produce quantities like lift and drag or field characteristics like pressures and velocities. In the form of partial differential equations, fluid dynamics interacts with physical laws. In order to effectively solve these equations numerically, sophisticated CFD solvers convert these rules into algebraic equations ("Computational fluid dynamics," 2014).



(The original Naga Pelangi, bedar, (45'/13.7 m LOD), built 1981, sailing off Singapore 1981)

## **1.2 Problem Statement**

For the bedar boat, it is made of cengal wood, which is more expensive than other woods. Therefore, converting the cengal wood to fiberglass is the best way because of its durability and cost. Anyway, the inherently brittle nature of fiberglass tends to crack easily, meaning we might be more prone to spending money on minor repair costs. It's heavier than other materials, which can pose problems with capacity and cause engines to work harder. When fiberglass was originally introduced as a composite, it had several advantages over wood for boat hull construction. First and foremost, it was cheaper! Boats constructed entirely of fiberglass could be produced for a third of the cost of their wooden counterparts. Of course, a lower production cost wouldn't mean much if no one wanted to buy the finished product.

It's crucial to understand that when utilized for this, fiberglass won't always be stronger than wood or aluminum. Unlike wood or aluminum, fiberglass is more flexible when bent and will quickly return to its original shape. While wood and aluminum are merely bent and may be hammered back into place, fiberglass may shatter at greater impact levels. One of the key aspects influencing ship design is ship resistance. Generally, a bulbous bow is implemented to reduce wave resistance because the bulbous shape is believed to attenuate the bow wave system. But, for the bedar boat, it used a spoon bow, which is causing little trouble to reduce wave resistance because of the bow shape. It may be more difficult than other boats because most of the boats since now use bulbous bow shapes. This will be one of the main problems for this project.