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MEC299

**HULL DESIGN AND STABILITY ANALYSIS OF
RIGID TUBE RIB**

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CHAPTER 1

INTRODUCTION

1.1 Background of Study

A rigid-hulled inflatable boat or, in a simpler way, a rigid inflatable boat (RIB), represents a very popular segment of light crafts, offering high performance and additional practical advantages (Pike, 2013). With improvements in the marine sector, large-scale vessels are now replacing many traditional leisure boats on the market. RIBs are high-performance, lightweight boats that combine tube-based vessels with traditional structural vessels. Rubber, sails, and other inflatable materials surround the boat's hull, which is built of either composite material like fibreglass or aluminium.

The hull is traditionally made in steel, wood or aluminium (Fragassa, 2019), despite the fact that fiber-reinforced polymer (FRP) composites have been the most popular material option in recent decades. Despite the fact that fiber-reinforced polymer (FRP) composites have been the most popular material option in recent decades. FRP composites permit, in fact, to create desired shapes and smooth surfaces, thanks to the manufacturing processes which competitiveness is difficult, if not impossible, to tie using other materials (Fragassa, 2017).

This project's primary focus is the rigid tube RIB's hull design and stability study using PolyCAD. PolyCAD allows to identify a variety of fundamental geometry representations. While there are some inherent curve and surface design tools, every designer will need to reference, convert or remaster geometry from other sources. A consistent design environment enables authoring and conversion between entities, as well as modelling scenarios that are restricted by other software tools.

PolyCAD help to design boats and ships by creating, manipulating, importing, and exporting geometry. PolyCAD isn't about having just enough capabilities to do a task at the lowest possible cost. This enables for the exploration of different user interface and hull surface design approaches without regard for a return on investment. PolyCAD was created out of a passion for hull design. It's not easy to design a hull surface. PolyCAD's user interface was designed to support design within the limitations of a 2D screen and mouse motions. During the design process, the user has access to tools like as snapping, constraints, transformations, and geometric and hydrostatic analysis.

As for the design of the boat, it is basically a Rigid Inflatable Boat that is modified and designed all its shapes according to the shape of PVC, because its sponsons (inflatable tubes that surround the boat) use PVC causing the hull to follow the shape of its sponsons so that it is easy to make while its hull is made of fiberglass. It also involves many processes including designing and making analysis based on the stability of Rigid Tube RIB using CAD tools.

1.2 Problem Statement

Today, it is impossible to criticise the models' consistency in the RIB market. It is not unexpected that RIBs are preferred by both the military and special services, as well as by regular water enthusiasts. Despite that it also has some problem to construct a safe and high-quality boat, one of the problems is the cost for making a RIB boat has been increasing and extremely high right now. The other problems are the skill for making one is little to none. In modern RIB for connection of the rigid bottom from plastic or aluminium with inflatable cylinders vulcanization, gluing and ultrasonic welding is applied (itBoat, 2020). Naturally, seams are bonded or electronically welded rather than stitched. This is one of the reasons for the relatively high cost – more than \$2,000 for some of the bigger models – of modern inflatables (“INFLATABLES: STABILITY and SAFETY (Published 1981),” 2022).

To overcome this problem, the material of RIBs for this project needs to be changed to lower the making cost. The material will be change into fiberglass. Fiberglass is far cheaper than aluminium and easier to handle. It doesn't require high skill to handle it. This boat uses PVC pipe for its sponsons part to replace the Hypalon, which is considered expensive to use in this project, although this material has many advantages of its own. Because the sponsons use PVC, one of the most difficult aspects of building this boat must be the hull. To make the creation process easier, the hull must follow the shape of the sponsons. Apart from that, we conducted research on the size and shape of PVC that would be ideal for use in the hull design of a rigid tube RIB boat.

The making process for this project will also use a modern one. For example, lines plan, stability, general arrangement, and hydrostatic curve will be recorded using PolyCAD. So that the future researcher can easily understand and can rebuilt the RIB boat easily.