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Design of Amphibian Vehicle

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Abstract*—Amphibious vehicle, vehicle for transporting passengers and cargo that can operate on land and in water. Amphibious vehicles include amphibious bicycles, ATVs, cars, buses, trucks, military vehicles, boats and hovercraft. It has a wide range of application in different fields. The main aim of this project is to design it efficiently for rescue purposes. This paper focuses on the concept of Amphibious vehicle which is to be designed. The designing process includes various steps. Designing is first and crucial step in fabrication of vehicle. Designing consist of rough ideas, parameters, selection of material and cad model to work on. The further process is proceeded by analyzing the model.*

Keywords*—*All Terrain Vehicle (ATV), Cad model*, *Parameters, Rough Idea, Selection of material.

I. INTRODUCTION

An amphibian vehicle can operate on both terrain i.e. land and water bodies as well. In this paper we will try to elaborate idea of designing an amphibian vehicle by considering various problems that will arise during designing the vehicle. Designing must be proceed as per various affecting factors on vehicle. Even aesthesis play a crucial role in designing as the vehicle should be attractive to look. Designing has to deal with an important factor i.e. cost, design should be functional as well as cost effective, by using maximum standard parts that are available in market to make the design cost effective. To make vehicle functional, some parts must be manufactured as per the requirement. The design is kept simple and effective without increasing the unnecessary complexity. Designing gives a theoretical idea of forces acting on it and as per them we can select the material to use.[1]

II. OBJECTIVE

[2]Considering the fact that we are exposed to coastal region we need to transport the goods from boat to coast & from coast to market. We also go through problem of flooding in low lying areas like Orissa, U.P, Bihar where instant flooding occurs & instant rescue operation is needed. Also we have seen necessity of crossing shallow water &river. People have to take long routes & thus it's time consuming; going through all these problems faced by the common man; we came up with an idea of a WATER CAR for land and water and which can be available at reasonable prices. The procedure of designing initiates with discussing the related concepts and brainstorming on those concepts. After getting a rough idea and finding most efficient way to overcome hurdles and calculating the required values a list of necessary parts is obtained. The outcome of our design is going to be easy handling with lighter weight, following which we can easily transport it to our destination. It is easy to assemble and dismantle and can be done in very less time without any specialized tools.Our aim is to make an Environment Friendly Vehicle so that it can be used anywhere. Since it can operate on land as on well as water bodies, which saves hassle of changing vehicle; which saves time and energy,it can become a useful medium of transport to common man in the today's world and developing countries. During natural calamities and war it can become an important asset to rely on to rescue people.

III. PROBLEM STATEMENT

To design the parts and select the materials as per the requirements through the process of defining the concept and brainstorming it, discussing the possible outcomes on it and deciding the efficient way to proceed, presenting the idea to the team and discussing with everyone, after that calculations are made and surveying the market for getting the most suitable parts and material for project as per the calculations.

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IV. METHODOLOGY

Designing is the first step of presenting the idea and planning, the further process of project or any other process which is to be performed. This process includes drawings, calculations, cad models etc.

Wikipedia defines as, "Design is the creation of a plan or convention for the construction of an object, system or measurable human interaction." Design has different connotations in different fields. In some cases, the direct construction of an object (as in pottery, engineering, management, coding, and graphic design) is also considered to use design thinking.[3]

The general steps followed in designing a machine are:-

- Preparation of a statement of the problem indicating the purpose of the machine.
- Selection of groups of mechanism for the desire motion.
- Calculation of the force and energy on each machine member.
- Selection of material.
- Determining the size of component, drawing and delivering to the manufacturing department.
- Manufacturing and assembling the machine.
- Testing of the machine

4.1 Steps involved in Designing process

4.1.1 Rough idea

It is the representation of the idea of the project which includes the through drawing of project and block representation. After the completion of deciding the needs and functionality of vehicle. And presenting the view to work. It's a crucial step which decides the further steps of designing. It gives a brief idea of which parts are necessary to make it functional.

4.1.2 Mechanism

Mechanism is a curial step as it decides the further working of vehicle. In this vehicle we are using 145.45cc petrol engine to power the vehicle on land and water as well, the vehicle mainly depends on buoyancy principle to float on water bodies. The flappers which are attached to wheel will be used to move forward in water bodies. The power will be distributed from engine through differential to both tyres.

4.1.3 Selection of material

The proper selection of material for the different part of a machine is the main objective in the fabrication of machine. For a design engineer, it is must that he is familiar with the effect which the manufacturing process and heat treatment have on the properties of materials. The Choice of material which we are using to make the vehicle is mild steel due to of following factors:

- Availability of the material
- Low cost.
- Easy to work on.
- High load capacity.
- Physical and chemical properties of material.
- Mechanical properties of material.

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4.1.4 Surveying

After selection of material and calculating dimensions of parts, surveying for the parts and material is to be done to make it cost effective and convenient to manufacture.

4.1.5 Arrangements

After completion of surveying the products available in market as per the need on vehicle, arranging them as per the functionality of part to maximize the efficiency.

V. DESIGN AND CALCULATIONS

5.1 CAD Design:

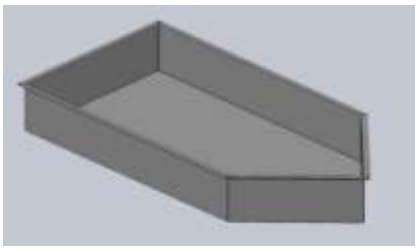
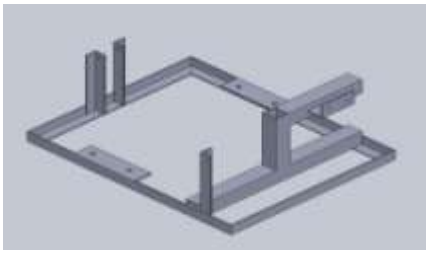

Fig. 1 (a): Isometric View of Boat (b):Engine Mounting


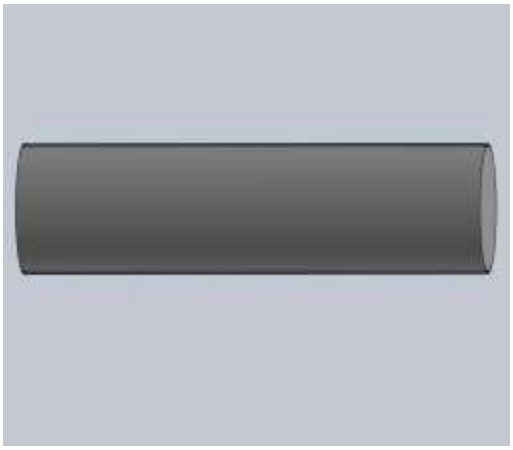

Fig. 2 (a): Isometric View of Seat (b): Isometric View of Shaft

Values:	**Calculated Values:**
Engine Specifications:- Capacity 145cc 8.5bhp@4000rpm 17Nm@3000rpm Gear ratios 1st gear 1:4.75 2nd gear 1:3.117 3rd gear 1:2.341 Tyres: No: 3 Front: 1 Rear: 2 Type: 4.00-8 70N	Max Torque=15.04Nm Minimum Force required to move Body=32.373N Initial(Moving) Torque=4.11Nm Torque at Engine=3.15Nm Torque after Gear reduction=15.4Nm Shaft Diameter=2cm Centre of Gravity: H=335mm L=800mm Weight Distribution=40:60 Buoyancy force exerting boat=200 N/m^3

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VI. CONCLUSION

This research is to design a mechanical vehicle of small type, filling the gap on the market. It is a new concept in India. With our ideas we are interested in investigating how to inspire the new generation to build an amphibious vehicle under the framework of creative thinking in the virtual world. In this stage, we have constructed the 3D model of amphibious vehicle according to design data. The development of body for amphibious vehicle is carried out based on the technical specification information required. This process started form design selection stage and will be completed with the fabrication process of body work. [4]

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