Natatorial Car

Amphibious

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Abstract— *Natatorial car is suited for both the land and water, so it is of amphibious nature. This car is powered by a mono engine for both the modes and is designed such that it avoids complicated waterproofings.*

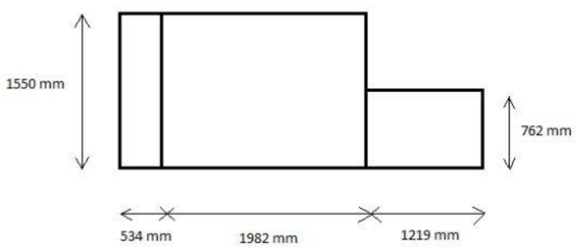
Keywords— *amphibhious car; mono engine; rear wheel spokes; paddles*

I. INTRODUCTION

You would have seen cars which go on land and water in the movies. Such cars do really exist, but the major drawback of those cars are that they are too expensive because they either use twin engines with wheel retraction unit or mono engine with additional transmission system to engage water propellers along with sophisticated waterproofings. This car uses mono engine for both the land and in water. Also there will be no transformations while switching between the land and water. So it is the same for this car to go on land and in water. The design of natatorial car keeps away complicated waterproofings that greatly reduces the price of maintenance and manufacturing

II. BUOYANCY

For an object to float, the buoyancy condition must be positively satisfied. Here, the dimensions of an average hatchback car are considered for the Buoyancy calculation.



For the volume calculation, the shape of the car is considered into rectangular segments and the buoyancy calculation is proceeded
Where the car's width = 1690mm

Volume of 1st segment = l*b*h = 1550*534*1690 = 1398813000 sq.mm

Volume of 2nd segment = l*b*h = 1550*1982*1690 = 5191849000 sq.mm

Volume of 3rd segment = l*b*h = 762*1219*1690 = 1569803820 sq.mm

Total Volume = 8160465820 sq.mm = 8.160 sq.m

Though sea water density ranges between 1029 to 1050 $kg/_{m}3$

Let, Density of water be 1000 $kg/_{m}3$

Buoyancy Force be "F"

F = Volume * Density of water * Gravity

F = 8.160*1000*9.81
F = 80049.6 Newton *(upward force exerted by water on car)*

Let *G* be downward force exerted by the car over the water,

G = Mass * Gravity
G = 1480*9.81
G = 14518.8 Newton

F > *G*

The value of *G* is far less than F

If the buoyancy force is greater than the downward force produced by the object, so the object will float.

On the other hand,

If the downward force is greater, it will sink and if they are equal, the object is said to be neutrally buoyant.

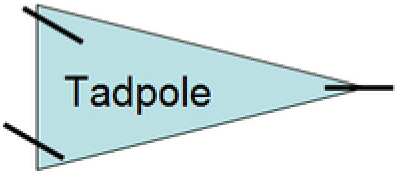
Let us see, the extent of weight upto which the car can float if it is made to float by providing a hull,

F = 80049.6/9.81 = 8160 kg

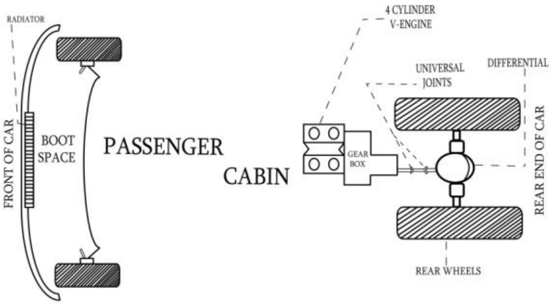
F = 8.160 tons
(Until the weight of the car exceeds 8.160 tons, it will float. To the maximum - the weight of the car, passengers, cargo, etc., together is never going to exceed 2.5 tons)

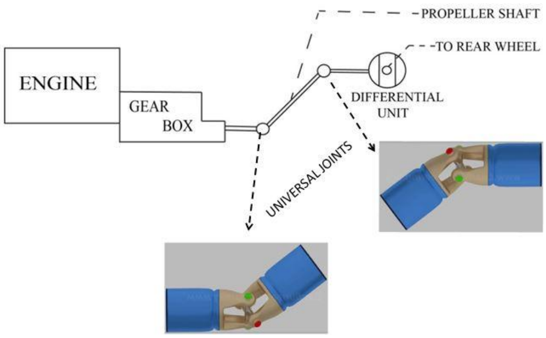
III. DESIGN AND WORKING

The car is completely asusual on land terrain both in terms of running and steering. In concern to the structure of the vehicle, for the best possible underbody hydrodynamics and various other aspects, it is designed as a tadpode shaped car which is inspired from the bird duck which is an amphibian too.

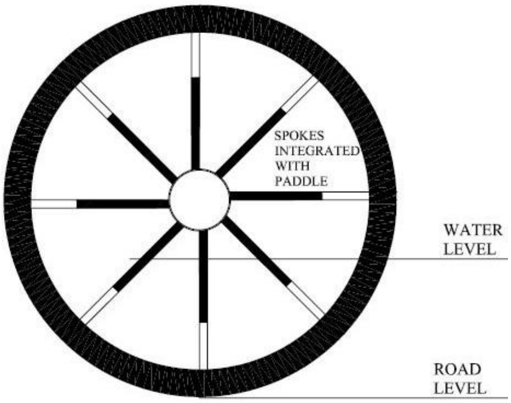


Actually this is a rear engine car with rear wheel drive and it must be powered by a 4 cylinder V engine (2 - 2.5 L). The usage of the V engine is to save the space occupied by the engine and to get higher power in comparison with the inline engine.





of Paddles are integrated into the spokes of the rear wheels that push the water and propel the car - as it was made in 1st generation ships. The condition for propulsion in water is that the paddles must enter the water by 220 degrees and must leave the water before 330 degrees. If all the wheels of this car are uniform size and are as usual as you see in a normal car, then when this car is in water all its wheels will be completely immersed in water. So when the driving wheels with paddles rotate, rotational force is generated in water rather than linear force. And thereby the car cannot effectively sail in water. In order to overcome this, the rear wheels of this car are made larger in size with paddles in it. Now the paddles enter the water by 220 and leave before 330 degrees. Thereby, the car can effectively sail in water. Also there comes an advantage of having larger rear drive wheels and it is the axle center of the rear wheel is at a height greater than the water level which avoids waterproofing the drive axle that greatly cuts off the cost of maintenance and manufacturing.



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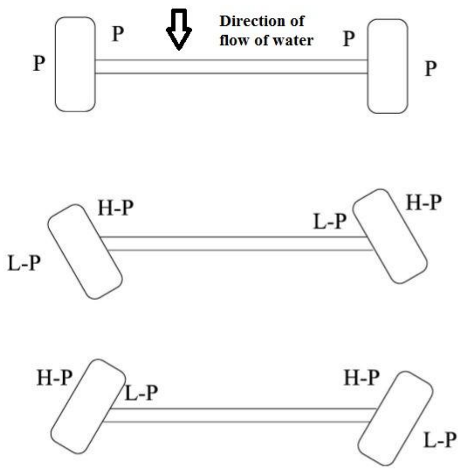
w let us see the principle behind the steering method of this car in water.



In the figure,

P – Pressure

HP - High Pressure

LP - Low Pressure

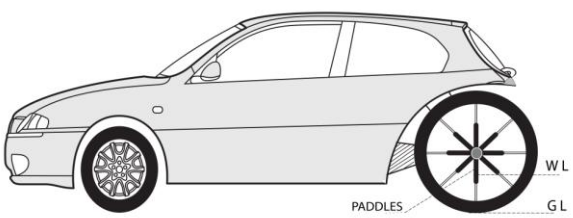
The diagram shows the top view of the front wheels and its axle. Higher pressure and lower pressure zones are created on either side of front wheels due to the flow of water. In the first case as the wheels are in straight position, equal pressure is created on both sides of the front wheels and thereby no net deviation in the direction. In the third case it is towards the right because the direction of force is always from the higher pressure zone towards lower pressure zone.

IV. DIFFERENT VIEWS OF CAR

A. *Front View*

Here is the front view of car. The independent bearings that carry front wheels in dead axle must be made waterproof which can be done easily at low cost.

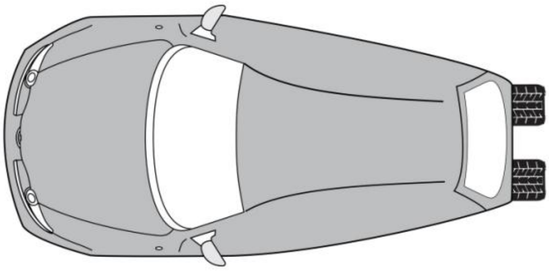
B. *Side View*



Where, (WL – Water Level while the car is in water; GL – Ground/Road level in land terrain)

C. *Top view*

The top view of the car is shown in the figure. Here the tadpole structure can be clearly seen.



V. APPLICATIONS

If this car comes in play, there are enormous applications

A. *Natural Calamities*

Natatorial car can be effectively used during natural calamity times such as floods. It can be employed for supplying food, medicines, etc,. During flood thousands of cars will be completely wasted, in such cases this car will be an exceptional one

B. *Tourism*

Tourism is one of the most important sectors for a country in terms of revenue. There are lot many places across the globe where this car can be effectively used but proper governmental norms and regulations must be followed before implementation.

C. *River Transportation*

India has about 14,500 kms of navigable waterways currently. If Indian rivers are interlinked as proposed, this car will be a boon in future. The risks of accidents & breakdowns are few in this form of transportation as compared to any other. People who longs for a bit lengthy and peaceful travel can adopt transportation by river thereby reducing traffic congestion in the roadways to an extent. Thus it opens a new channel of transportation.

D. *Beach Patrol and Coast Gaurd*

This car can be used by the beach patrol and coast guards for their various uses such as patrolling, etc.,

E. *Police, Military and Navy*

Police, military and navy will have numerous applications occasionally, if this car comes in play.

F. Entertainment

For this car, games involving streams of land and water can be designed. Everyone love to play games with their own vehicle, which will become a tourist attraction to the theme parks, dams etc., Proper governmental norms and rules must be followed. This will be a target to youngster community which brings in revenue to the tourism corporation of India.

VI. ADVANTAGES

- ✓ Can be used both in water and land
- ✓ Can be used for rescue purposes during floods for saving life. The vehicle which can go both on land & water will be an appropriate one
- ✓ Can be produced at comparatively cheaper cost
- ✓ Single propulsion system is used
- ✓ No switching time (0 second) between modes of land and water
- ✓ No wheel retraction, additional transmission system and water propellers
- ✓ Fuel efficiency is higher while used in water
- ✓ No complicated waterproofing are used
- ✓ Highest possible aerodynamics can be achieved since it is tadpole shaped vehicle

VII. DISADVANTAGES

- ✓ Speed is moderate in water
- ✓ Pair of tyres are not of uniform size
- ✓ The weight of the car is relatively high due to the hull at the base
- ✓ Comparatively requires high power engine in consideration to its weight
- ✓ Fuel efficiency will be low
- ✓ Precautionary safety measures - life jackets, radar, GPS with country boundaries & other safety systems must be added.

VIII. CONCLUSION

Thus this car uses single propulsion system with no complicated waterproofing techniques making it cheaper and affordable to the people. The natatorial car has neither any transformation nor consumes time while switching between the land and water. During natural crisis this car can serve its best in saving life. Also it provides an extra utility for people, government and other institutions.

IX. FUTURE SCOPE

The car will be made much more affordable by further cutting down the cost. The difference in size of pairs of front and rear wheels will be reduced as much as possible. The top speed in water will be much more increased in future design.

X. LITERATURE REVIEW

The first known self-propelled amphibious vehicle, a steam-powered wheeled dredging barge, named the Orukter Amphibolos, was built by US inventor Oliver Evans in 1805. Amphibious car came out in the 1920 - Amphicar was the first commercially successful amphibious car. Amphicar was manufactured in Berlin Germany from 1962 to 1967. It was the only non-military amphibious vehicle ever put into production on a commercial basis during that period.

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