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Design and Fabrication of Hovercraft with an Extended Wing

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Abstract: Hovercraft is a special mode of transport which can be used to travel on both terrain and water. This research work intends to fabricate a Hovercraft which can operate in water and inclines over sand, mud, grass, swamp, desert, ice and snow even at very low cost. Its wing and horizontal stabilizers enables us to simply hop over water or land based obstacles. The hovercraft will be constructed using depron foam, fibre. The hovercraft will be controlled using 2.4ghz radio transmitter. The thrust for the hovercraft is produced by 820kv out runner motor, which utilises the power from two 4 cell lithium polymer battery.

Keywords: depron foam, Cushion effect, Hovering.

I. INTRODUCTION

Hovercraft work primarily on the principle of lift using air pressure differences. They are similar to airplanes, but the difference is that hovercraft generate lift its own. It does not require velocity to create pressure difference, as in airplanes. It uses motors and fans to force air under the hovercraft itself. The air is forced into an air chamber called plenum chamber or air box. If the pressure inside the air box is higher than the weight of the hovercraft, the hovercraft will rise off the ground.

II. MATERIALS USED

Body is constructed using depron foam and Carbon fiber. Control surface are made using EPP foam. Control surface are attached to the hovercraft with carbon fibre rods an fiber tape.

	Materials Used	
1.	HOVERING AIR BAG	BUTYL SYNTHETIC RUBBER
2.	BODY	DEPRON FOAM
3.	CONTROL SURFACES	EPP FOAM

III. FABRICATION

Fig 3.1 Making the base of hovercraft from the material depron sheet

Fig 3.2 A hole of 14cm diameter on the base and a path for the air flow is made

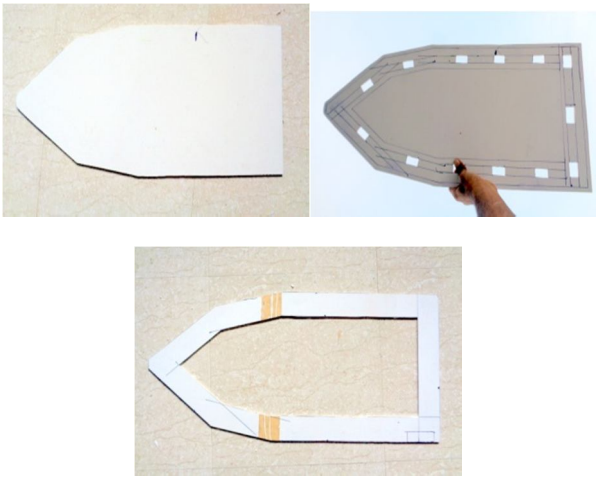

Fig 3.3 Cut the multi-wood as 1 base and 1 strips and made holes on both.

Fig 3.4 A tube like structure is made from two piece of synthetic rubber sheet and it is inserted through the multi-wood strip.

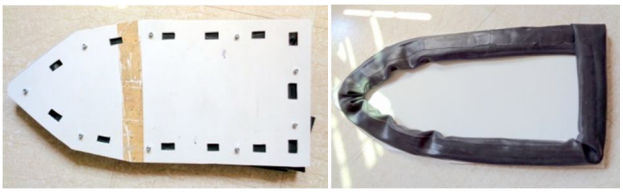

Fig 3.5 Fix the multi-wood strip on the multi-wood base by inserting nuts through the tube and it is fixed on the base.

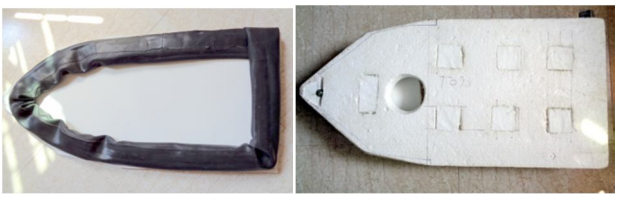

Fig 3.6 This piece is pasted on the depron base by making some hole on the depron and it is fixed with screws

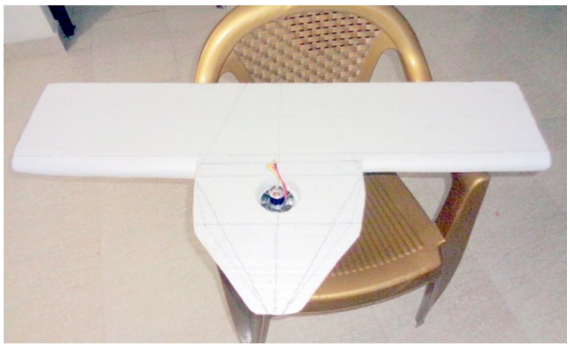

Fig 3.7 Middle portion

1) Middle portion which consist of wing is made by
a) Making edge curved
b) Cutting airfoil shape on the wing
c) And hole is made for mounting hovering motor

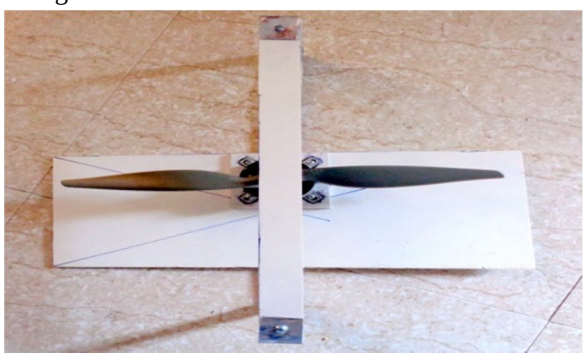

Fig 3.8 Thrust Motor

2) Thrust motor is fixed on the multi-wood piece
a) Rudder is mounted by making rectangular mount with multi-wood and it is joined by screwing clamps

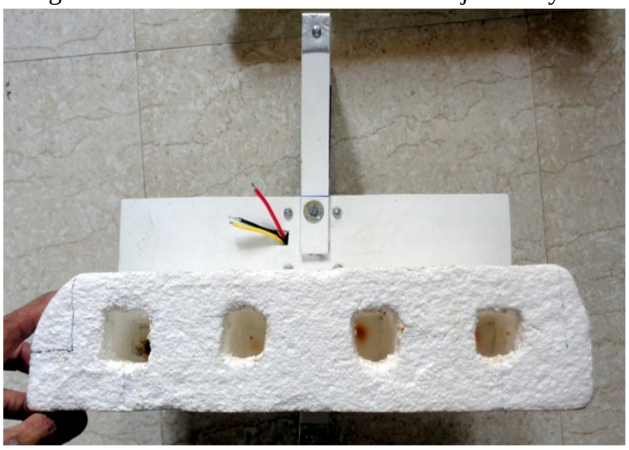

Fig 3.9 The multi-wood with thrust motor is fixed on a rectangular form, and tightened with screws

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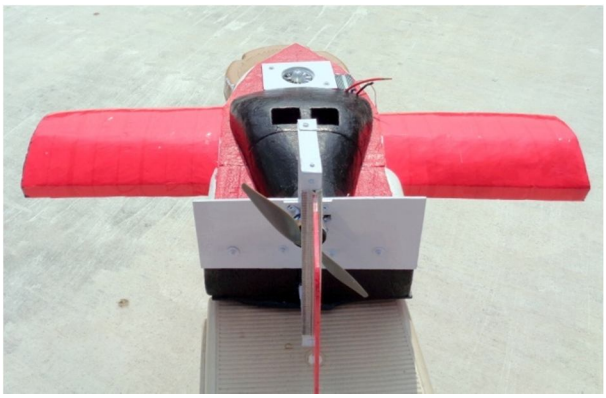

Fig 3.10 Rudder is fixed on the rudder mount.

Fig 3.11 Top canopy

3) Top canopy is made of depron foam

a) It is painted with foam safe paint

b) Fix the hovering motor by screwing with the multi-wood for better fixing.

SPECIFICATIONS	
Motor	Brushless Outrunner Motor 820 KV Hovering Motor 4000 KV
ESC	80A ESC
Propeller	12 X 8 Carbon Fibre Prop
Battery	14.8 V 4 CELL LIPO Battery
TRANSMITTER/RECEIVER	2.4 GHZ 4 Channel RF

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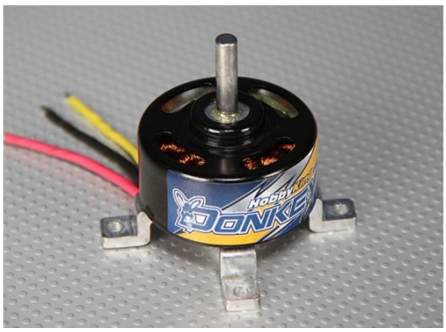
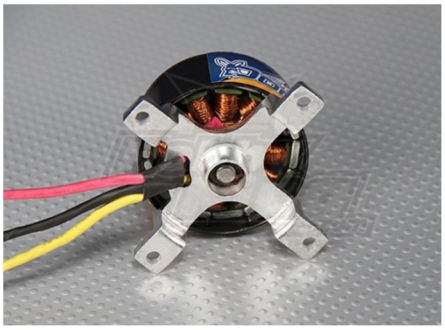


3.12 Thrust Motor

Here an out runner motor of 820 KV is used which can produce a thrust of nearly 2500gm, which can obtain an rpm of 12136



3.13 Hovering Motor

3.14 Balancer

i) Capable of Balancing Li-Po, Li-Ion Batteries
ii) Input Voltage - 11-18 V
iii) 1-5 Amp Current

4) Speed Controler

It has a 80A electronic speed controller for varying the speed of Hovering motor and 70A for thrust motor.

A. Aerofoil Used

DHMTU (Department of Hydro-mechanics of the Marine Technical University) 12-35.3-10.2-80.12.2

B. Advantages of DHMTU Airfoil

1) It has been found that the overall drag of the DHMTU decreases with altitude

2) The DHMTU possesses superior lift generating performance.

IV. PAYLOAD

1.	Thrust Motor	245 gm
2.	Hovering Motor	245 gm
3.	Thrust Motor Propeller	18 gm
4.	Hovering Motor Propeller	18 gm
5.	Thrust Motor Esc	108 gm
6.	Hovering Motor Esc	108 gm
7.	2 Lipo Battery	527 gm x 2 = 1054 gm
8.	2 Servos	22 gm x 2 = 44 gm
9.	Approx Body Weight	3404 gm
10.	Total Weight	5250gm

V. RESULT

The hovercraft with extended wing was lifted and was propelled by the thrust system.it was able to lift 2.5 kg of weight and hovered with an air cushion of 0.5 inch. Maneuverability was achieved by controlling the ruder system using RC controlling.

VI. CONCLUSION

The craft principle has been demonstrated using low cost material and has proved capable as a variable means of transport both on land and water after series of test. The propulsion and lifting systems gave excellent performance and with good maneuverability. This craft designed can be used for future transport with efficient stability and lower cost.

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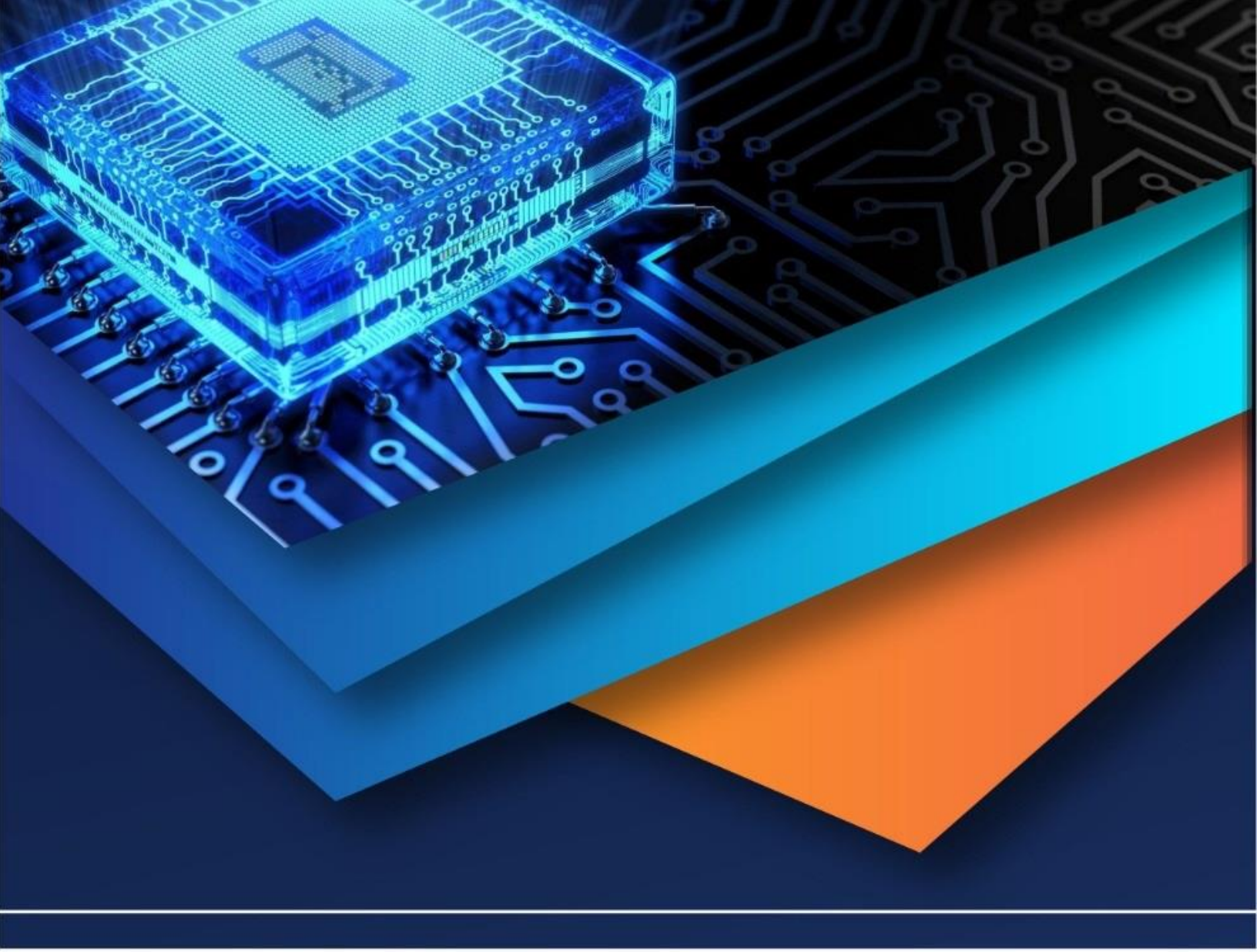

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