A Hovercraft

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ABSTRACT

The design and development of a hovercraft prototype with full hovercraft basic functions is reported by taking into consideration, size, material and component availability and intermediate fabrication skill. In-depth research was carried out to determine the components of a hovercraft system and their basic functions and in particular its principle of operation. Detailed research in design was done to determine the size of component parts, quite in accordance with relevant standard requirements as applicable in the air cushioned vehicles (ACV) [1]. The fabrication of the designed hovercraft by using materials that are readily available by taking into consideration the economic constraints and time constraints. It also includes the testing process which includes the tweaking of various parameters that govern lift and thrust of the hovercraft. Further research is recommended to improve on the efficiency of the craft.

Keywords--- Hover craft, air cushioned vehicle, hybrid vessel, hull, skirt, air box.

I. INTRODUCTION

Vehicles designed to travel close to but above ground or water. These vehicles are supported in various ways. Some of them have a specially designed wing that will lift them just off the surface over which they travel when they have reached a sufficient horizontal speed (the ground effect). Hovercraft is such a vehicle. Basically hovercraft is a vehicle that:

- Drive like a car but
- Flies like a plane.
- It can hover over or move across land or water surfaces while being held off from the surfaces by a cushion of air.
- Float like a boat.

A hovercraft, also known as an air-cushion vehicle [8] or ACV, is a craft capable of travelling over land, water, mud or ice and other surfaces both at speed and when stationary. Hovercrafts are hybrid vessels operated by a pilot as an aircraft rather than a captain as a marine vessel. Hovercrafts are usually supported by fans that force air down under the vehicle to create lift. Air propellers, water propellers, or water jets usually provide forward propulsion. Air-cushion vehicles can attain higher speeds than can either ships or most land vehicles and use much less power than helicopters of the same weight.

Hovercraft is a transportation vehicle that rides slightly above the earth’s surface. The air is continuously forced under the vehicle by a fan, generating the cushion that greatly reduces friction between the moving vehicle and surface. The air is delivered through ducts and injected at the periphery of the vehicle in a downward and inward direction. This type of vehicle can equally ride over ice, water, marsh, or relatively level land.

II. METHODOLOGY

Our paper presents a reasonable BLDC Motors and a Servomotor based interactive Hovercraft. A number of literatures related to the topic of Air Cushion Vehicle (ACV) and monitoring is reviewed and analyzed.

ELEMENTS OF AIR CUSHION VEHICLE

1) PLATFORM

The base of any ACV is made up like this that it can protect the vehicle from any causes. The base is also too strong which can bear the payload and also the other load for which it will be designed. When the ACV is made for the commercial and rescue purpose in which are the land surfaces are get covered then the base should be taken strong. The platform is a base of the Air cushion vehicle. The base is the thing on which the all equipment of the Air cushion vehicle is mounted. The base is basic requirement
of the Air cushion vehicle on which all the design will take place. The base is taken by us is made of wood, wood have the elasticity when the load is applied so we take the wooden platform\(^2\).

2) **SKIRT**

Despite the momentum curtain being very effective the hover height was still too low unless great, and uneconomical, power was used. Simple obstacles such as small waves, or tide-formed ridges of shingle on a beach, could prove to be too much for the hover height of the craft. These problems led to the development of the 'skirt'. The skirt is a shaped, flexible strip fitted below the bottom edges of the plenum chamber slot. As the hovercraft lifts, the skirt extends below it to retain a much deeper cushion of air. The development of the skirt enables a hovercraft to maintain its normal operating speed through large waves and also allows it to pass over rocks, ridges and gullies. The skirt of a hovercraft is one of its most design sensitive parts. The design must be just right or an uncomfortable ride for passengers or damage to the craft and the skirts results. Also, excessive wear of the skirt can occur if its edges are flapping up and down on the surface of the water. The skirt material has to be light flexible and durable all at the same time. For the skirt to meet all of its requirements the design and use of new materials has slowly evolved. The current skirts use Infringers at the lower edge of the skirt envelope which can be unbolted and replaced. By doing this there is a quick and easy way to counter the effects of wear without having to replace the whole skirt structure. Skirt is the material which is made by the gelatin. The skirt is taken to hold the air pressure which is generated inside the base or downside of the platform. The skirt is mounted on the base by the nail or other thing which can bear the pressure of air. The skirt is also taken by the material which can bear the pressure of air\(^2\).

3) **MOTORS**

3.1) **BRUSHLESS DC MOTOR**

1000Kv Brushless Dc Motors\(^5\) is also known as electronically commutated motors (ECMs, EC motors) are synchronous motors that are powered by a DC electric source via an integrated inverter switching power supply, which produces an AC electric signal to drive the motor. In this context, AC, alternating current, does not imply a sinusoidal waveform, but rather a bi-directional current with no restriction on waveform. Direction is provided by using a servomotor\(^6\).

**1000 KV BLDC**

Specifications:
- KV: 1000KV
- Max efficiency: 80%
- Max current: 4-10A
- Current capacity: 12A/60s
- No load current at 10v: 0.5A
- Weight: 57g
- Shaft diameter: 3.17mm
- Motor dimensions: 27.5*30mm
- Power: 180w

**2200 KV BLDC**

Specifications:
- KV: 2200KV
- Max Efficiency: 80%
- Max current: 34A
- Weight: 50g
- Shaft diameter: 3.17mm
- Motor dimensions: 27.5*30mm
- Power: 342w

3.2) **MICRO SERVO**

Specifications:
- Motor type: 3 pole
- Rotation/ Support: Bushing
- Pulse width: 500-2400 micro seconds
III. WORKING PRINCIPLE OF AIR CUSHION VEHICLE

The hovercraft floats above the ground surface on a cushion of air supplied by the lift fan. The air cushion makes the hovercraft essentially frictionless. The hovercraft relies on a stable cushion of air to maintain sufficient lift. The air ejected from the propeller is separated by a horizontal divider into pressurized air utilized for the air cushion and momentum used for thrust. The weight distribution on top of the deck is arranged so that the air is distributed the air from the rear of the deck throughout the cushion volume in an approximately even fashion to provide the necessary support.

The skirt extending below the deck provides containment, improves balance, and allows the craft to traverse more varied terrain. We maintain the rigidity of the skirt by filling the air-tight skirt with the same pressurized air diverted towards lift. The skirt inflates and the increasing air pressure acts on the base of the hull thereby pushing up (lifting) the unit. Small air gaps are left underneath the skirt prevent it from bursting and provide the cushion of air needed. A little effort on the hovercraft propels it in the direction of the push. Steering effect is achieved by mounting rudders in the airflow from the blower or propeller. A change in direction of the rudders changes the direction of air flow thereby resulting in a change in direction of the vehicle. This is achieved by connecting wire cables and pulleys to a handle. When the handle is pushed it changes the direction of the rudders.

IV. APPLICATIONS

By using Air cushion vehicle no need of change of vehicle according to the land.
1. Downdraft associated with helicopters, & a fraction of the cost to purchase, operate & maintain. Rescuers can reach floods, mud, and sand & ice victims without exposing rescuers to life threatening danger.
2. Distribution of famine or flood aid support craft. Relief work (United Nations).
3. Civil emergency & infrastructure support
4. Oil industry survey, exploration & pipeline patrol.
6. Remote mining access support vehicle.
7. River, lake & port geological surveys.
8. Mud & riverbed sampling.
10. Airport bird scaring/support/rescue services.
11. Coastal civil engineering & bridge construction & repair/maintenance.
12. Transport, service & safety craft for river & low tide coastal work where 24-hour access is vital for staff safety.
13. Fish farm & low tide access.
15. Access to Riverside, lakeside & island properties. Hovercraft travel over mud, sand & ice. Hovercrafts are not restricted by tide, or fast running water. Or shallow water, or submerged rocks, coral, or marine life.

V. HARDWARE DIAGRAM
VI. RESULT

Basically we have made a working model of Hovercraft which has properties similar to that of Hovercraft. We have made this working model using motors and an electronic remote for its proper functioning. The remote is responsible for the handling of the model during the practical working or operating and motors are responsible for the movement of the model. In our working model we have used motors instead of engines to its movement. In this way we are able to get success in our project by making a proper working Hovercraft.

VII. CONCLUSION

Hovercrafts are generally simple mechanisms in theory. Yet the process from theory to manifestation is not as easy as it may seem. A plethora of problems exist and must be faced in order to attain a well-functioning hovercraft. The plans and designs must be flawless. One must take under consideration the weight and the shape of each component in order to avoid problems such as instability and dysfunction. This is a marvelous machine which greatly cuts down the friction which in turn helps it to attain greater speed.

Varieties of problems and factors have to be taken into account in designing and constructing a hovercraft. The difficulties involved in maintaining stability and functional competency has limited the application to only transportation or for military purpose. The cost involved in the developing of a hovercraft is also another impediment to the widespread use of this machine.

VIII. FUTURE SCOPE

1. The future of hovercraft seems uncertain, but there is good chance there will be huge port all over the world. Thinner hovercraft might be built so civilian can drive safely on road.
2. Development in Neoteric Hovercraft Technology
3. The future is more promising than ever before.
4. The future of hovercraft seems uncertain, but there is a good chance there will be huge hover ports all over the world, like the one in the picture.
5. Thinner hovercraft might be built so civilians can drive safely on roads. It also seems likely that the larger hover vehicles will become larger than ever! Hovercrafts are likely to be capable of high flight.
REFERENCES

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