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An Overview Air Cushion Vehicle

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***Abstract*: The air cushion vehicle, or "HOVERCRAFT," as it is commonly referred as, is the newest vehicle on the road today. This car is not just novel, but it is also distinct from other, more traditional vehicles. It is a terrestrial vehicle in that it does not require surface contact for traction and may move freely across a variety of surfaces while being supported constantly on a self-supporting platform. Hovercrafts are utilized in a variety of situations when persons and equipment must go by water while still being able to load and unload on land. They may even be used as battleships. Hovercrafts are thrilling to fly, and the sensation of easily transitioning from land to water and back is unrivalled. A hovercraft, also known as an air-cushion vehicle (ACV), is a ship that can move over any flat surface while being supported by a cushion of slow moving high- pressure air that is ejected downwards against the surface below and confined within a "SKIRT."**

***Keywords*: Air cushion, Cushioned vehicle.**

1. Introduction

Vehicles that are designed to travel close to the ground but above water. These vehicles are aided in a variety of ways. When they attain a certain horizontal speed, some of them have a specifically built wing that lifts them slightly off the surface over which they move. Hovercrafts are an example of such a vehicle. Hovercrafts are vehicles that, in essence, 1. drive like a car yet, 2. fly like a bird, 3. It can hover over or move across land or water surfaces while being held off from the surfaces by a cushion of air, 4. Float like a boat.

Fig. 1. Air cushioned vehicle

Hovercrafts, also known as air-cushion vehicles or ACVs, are vehicles capable of travelling over land, water, mud, ice, and other surfaces at high speeds as well as when stationary.

Hovercrafts are hybrid boats that are piloted like planes rather than being commanded like a ship.

Fans that drive air down under the vehicle to provide lift, air propellers, or wands are commonly used to assist hovercrafts, 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.

Hovercrafts are a type of transportation that flies just above the earth's surface. A fan constantly blows air under the car, creating a cushion that considerably lowers friction between the driving vehicle and the ground in a downward and inward direction. This sort of vehicle may travel on ice, water, marsh, or generally flat terrain.

They work by forming a cushion of high-pressure air between the vessel's hull and the ground below. This cushion is usually enclosed in a flexible "skirt." They usually fly at a height of 200mm to 600mm above any surfaces, with a top speed of 20 knots and clear gradients of up to 20 degrees.

2. HISTORY

Many attempts have been made to comprehend the concepts of pressure beneath hulls and wings.

The majority of these can be classified as "ground effect" or "water effect" vehicles rather than hovercraft to a large extent. The main distinction is that a hovercraft can elevate itself while still in motion, whereas most other designs require forward speed to lift. In other circumstances, "surface effect vehicles" are referred to as ekronoplan and hydrofoils.

In 1716, Swedish physicist Emmanuel Sweedanborg introduced the term hovering for the first time in the historical record of the concepts behind surface-effect vehicles.

Dagobert Müller (1880-1956), an Austrian, constructed the world's first "water effect" vehicle in 1915. The craft, which was shaped like a section of a large aerofoil, was propelled by four aero engines driving two submerged marine propellers, with a fifth engine blowing air under the front of the craft to increase air pressure under it. Only when the craft was moving could it trap air under the front, increasing lift. The watercraft could not shift to land or other surfaces because it required a depth of water to operate. The Versuchsgleit boat was designed

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as a fast torpedo boat with a top speed of over 32 knots (59 km/hr). It had undergone extensive testing and was even equipped with torpedoes and machine guns for use in the Adriatic. It was never used in combat, and as the war continued, it was scrapped due to a lack of enthusiasm and apparent need, and its engines were returned to the airforce.

Konstantin Eduardopich Tsiolkovskii developed the theoretical foundations for motion over an air layer in 1926 and 1927.

Toivo J. Kaario, a Finnish aeroengineer, began building a developed form of an aircushion vessel in 1931 and completed a prototype pintaliitaja in 1937. The current features of a lift engine pumping air into a flexible envelope for lift were featured in Kaario's design. Kaario never secured financing to develop his concept, but Vladim followed Kaario's work closely in the Soviet Union. During the 1930s, Levkov designed and built a number of comparable ships, with his L-5 fast attack boat reaching 70 knots (130 km/hr) in testing. However, Levkov's development work was put on hold as World War II broke out.

During World War II, Charles Fletcher, an engineer in the United States of America, designed a walled aircushion vehicle. Fletcher was unable to file a patent since the project was classified by the US government.

Christofer Cockerell, a British inventor, began experimenting with such vehicles in the early 1950s, and in 1955 he received a patent for a vehicle that was "neither an air plane, nor a boat, nor a wheeled land craft." He had a boat builder make a two-foot prototype, which he showed to the military in 1956 but failed to pique their interest. In 1959, a commercially constructed one-person hovercraft crossed the English Channel, thanks to Cockerell's efforts. A British vehicle was the first of two to enter active surface in 1962.

3. Constructional Features of Hovercraft

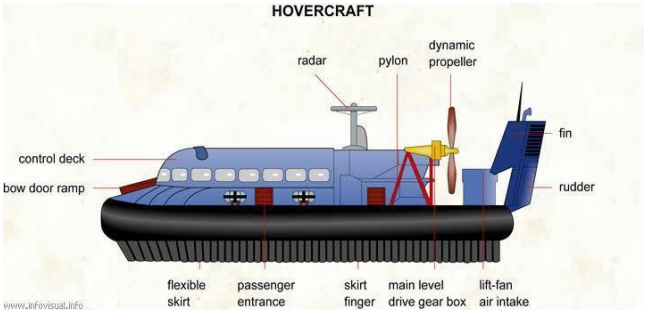

Fig. 2. Constructional features of hovercraft

1. RADAR: an equipment that uses microwaves to detect objects.
2. Pylon is a type of support post.
3. Fin: steering device.
4. Rudder: apparatus that prevent drift.
5. Lift-fan intake: opening to allow air to enter.
6. Main level drive gear box: compartment that contains and protects the gear mechanism.
7. Dynamic propeller: a motion-generating device with two blades.
8. Skirt finger: Part of the flexible skirt.
9. Passenger entrance: opening the side wall that provides access to the passenger cabin.
10. flexible skirt: lower flexible part.
11. Bow door.

4. Hovercraft Operation

Piloting a hovercraft is an interesting proposition. Since very little of it actually touches the ground, there isn't much friction, making it very difficult to steer and also very susceptible to strong winds. Imagine trying to drive around on top of an air-hockey puck! We've discovered that the best way to drive it is treat it like a jet ski, leaning back and forth and steering very carefully. It is also possible to do a 360-degree turn without stopping, which is quite a sight.

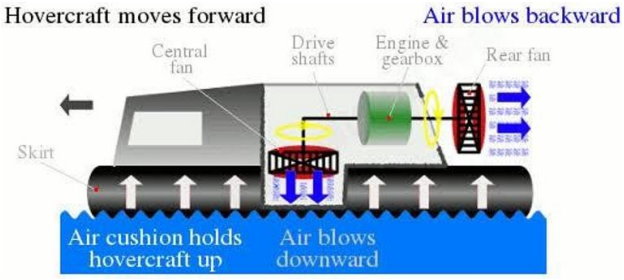

Fig. 3. Hovercraft operation

5. Aerodynamics

Aerodynamics is defined as the branch of fluid physics that studies the forces exerted by air or other gases in motion.

Examples include the airflow around bodies moving at speed through the atmosphere, the behaviour of gas in engines and furnace, air conditioning of building, the deposition of snow, the operation of air conditioning of building, the deposition of snow the operation of air cushions vehicles wind loads on buildings and bridges ,bird and insect flight, musical wind instrumental and metrology .for maximum efficiency, the aim is usually to design the shape of an object to produce a streamlined flow with a minimum of turbulence in the moving air. The behaviour of aerosols or the pollution of the atmosphere by foreign particles are other aspects of aerodynamics.

6. Working Principle of Hovercraft

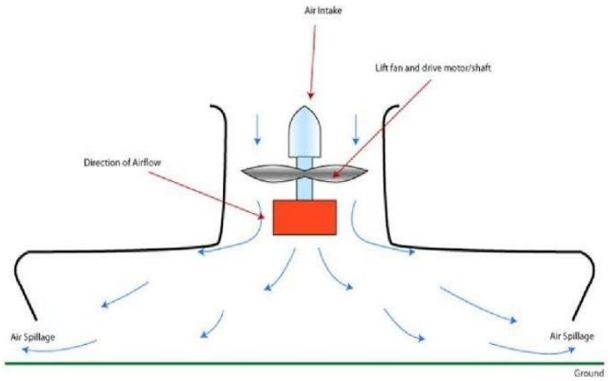

Fig. 4. Working principle of hovercraft

Hovercraft work on the two main principles of lift and propulsion. when dealing with a hovercraft the existence of lift is imperative for the proper function of the vehicle. Lift is an essential factor because it is that which allows the craft to ride on a cushion of air cushion vehicles of air several inches off the ground. This process of attaining lift it began by directing airflow under the craft.

The shape of the body also affects the stability of the hovercraft. The larger the area of the base, the more stable it will be wider base implies greater stability. Longer and narrower shapes increase speed but decrease stability. Most hovercrafts have rounded ends and offer both stability and speed.

The skirt another vital component skirt is known as bag skirt. It is comprised of a bag that covers the bottom of the base and has a holes in it to allow air to escape and push the craft of the ground. Each part of the skirt inflates independently which makes repair much easier and improves stability. Unfortunately, the more stable of skirt the slower it will go.

7. Advantages of Hovercraft

1. Can carry a relative size payload.
2. Can be launched from ship.
3. Travel over any surface.
4. Shortcutting routes.
5. Travel rivers up as fast as down, irrespective of the current.
6. Travel in dry water beds.
7. No collisions with debris, logs etc.
8. Access to 75% of coastal area instead of only 5%with conventional vessels.
9. No turbulence or impact in water as no propeller chumps up the water so sea life remains untouched.
10. Travel in dry water -beds independent from and jetties.

8. Disadvantages of Hovercraft

1. They move a lot of air and can carry a lot of weight.
2. Steep grades may be a problem.
3. The possibility of skirt damage or puncture.
4. Not particularly agile.
5. The hovercraft is large and fast, making it challenging to manoeuvre on land.

9. Applications of Hovercrafts

1. The downdraft that comes with helicopters, as well as the friction of the cost to buy, operate, and maintain them. Rescuers can reach victims of floods, mud, sand, and ice without putting themselves in danger.
2. Famine or blood distribution in life- threatening situations.
3. Assistance with civic emergencies and infrastructure.
4. Survey, exploration, and pipeline surveillance in the oil industry.
5. Electrical power line safety and patrol.
6. Support vehicle for remote mining access.
7. Geological surveys of rivers, lakes, and ports.
8. Riverbed and mud samples.
9. Projects and clean-up activities in the environment.
10. Services for scavenging, supporting, and rescuing birds at airports.
11. Coastal civil engineering and bridge building, as well as repair and maintenance.
12. Transport service and safety craft for river and low tide coastal work when personnel safety requires 24-hour access.
13. Low-tide access and a fish farm.
14. Leisure and family fun rental operations, corporate entertainment, Education schools summer fetes and shows.
15. Super yacht tenders.

10. Conclusion

Hovercraft are used for a number of reasons around the world, and their popularity is expanding, leading to new and improved designs and more applications.

With its safety and adaptability, it can become one of the most important and economical means of transport in future.

Hovercrafts are relatively simple mechanics in theory, but the transition from theory to reality is not as straightforward as it appears. A slew of issues arises, all of which must be solved flawlessly. In order to minimize problems like instability and malfunction, one must examine the weight and geometry of each component. This is a fantastic gadget that significantly reduces friction, allowing for more speed and stability. In designing and building hovercraft, a variety of problems and factors were considered. The expense of developing a hovercraft or a hovercraft for military use. Another hurdle to the widespread use of this machine is the high expense of building a hovercraft.

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