FABRICATION AND TESTING THE PROTOTYPE OF HAVOR BIKE

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ABSTRACT

The Hover bike prototype is a one-third scaled model of full-sized Hover bike (manned). This is an attempt to develop a prototype having propellers that are driven electrically integrating tilt motor mechanism, where servo motors are used to manoeuvre the model. The objective is to fabricate a light-weight weight prototype that contains a payload bay, attain longer endurance and range, reduction in the cost, utilize less power to realize lift, provide longer battery life, reduce programming steps and be simple in design compared to the prevailing drones. The mechanical design of the AFV comprised both the choice of a battery-motor gearing-prop combination for efficient thrust production as well as the planning of a light-weight yet sufficiently stiff vehicle structure. In addition to an efficient mechanical design, the vehicle also required onboard control and inertial guidance.

Key words: *Hover bike, AFV, Manoeuvre, propellers, Prototype, Thrust, CatiaV5, Solid Works*

1. INTRODUCTION

A Hover bike can be defined as a combination between a motorcycle and a helicopter. The Hover bike flies like a quadcopter, and can be flown manned or unmanned, while being a safe level - low level aerial workhorse with low on – going maintenance. It is easy to operate and can be applied to various purposes because it does not need a runaway and is capable of hovering from any terrain. . In the case of the ducted-fan type flying bike, its rotor is covered with duct which lowers the risks of rotor damage caused by tiny bugs and foreign object.

Thrust vectoring can be done by special design and technique so that it can able to fly almost in all directions. Moreover it can able to take off and land vertically from any land. It does not need any runway [1]. The duct-fan type bike was developed under an innovative operational concept of landing on small areas such as the roof of a building, and of preventing excessive fuel consumption during hover flight.

The advantages of a hovering vehicle over a fixed wing flying vehicle include the minimal space required for takeoff and landing of the vehicle, maneuverability in obstacle-heavy environments, and the ability to maintain a static position and orientation if so desired.

Fig. 1: Bi copter Hover bike prototype

2. LITERATURE SURVEY

Aerofex tested the hover bike for speed and stability at the Mojave Desert. The hi-tech vehicle flew through the desert at speed of up to 50km/h. Although it was slower than the "Star Wars" speeder bikes, the machine proved that flying can be as easy as riding an ordinary bike. AEROFEX said that it has no plan of selling the vehicle and the technology was just intended to develop unmanned drones. [2].

The original Hover bike was built by Chris Malloy of New Zealand, after work and studies in his garage in suburban Sydney, Australia. His project started out as a hobby, but quickly grew into a commercial enterprise, with interest from people and group such as universities, farmers, military, with notable visits from US Army G-3/5/7 and Lockheed Martin's 'Skunk Works'. Most of the frame of original Hover bike was handcrafted from carbon fibre and aluminium with a foam core [3].

3. OBJECTIVES

To design a prototype that will help in:

- Surveillance, material handling, cattle mustering, movie industries and Military and Emergency Services.
- Search and rescue operations.
- To reach some areas inaccessible to road vehicles and helicopters.
- Carrying supplies if extraction is impossible.
- Rescuing people who fall through ice. The response time would be much quicker than a helicopter, and
- To be made used for general purpose applications.

4. DESIGN

A. Factors considered for Frame design:

- Body shape: Shape should be aerodynamic to decrease the drag offered by air. It should cover less floor area.
- Housing for motor and propellers: housing should be of low weight. Selecting aluminium as a material for housing.

B. Factors considered for propeller design:

- Number of blades: The lower the more efficient the propeller is. We are using two blade propellers for our prototype as it gives plenty of area for lift and keeps it an efficient design at the same time.
- Material: Nylon fibre propellers for more efficient working.
- Size: Propellers are classified by length and pitch. Improved propeller pitch and length will draw more current Propellers with too high pitch will require more power.

C. Factors considered for motor selection:

- High speed operation.
- Responsiveness: Quick acceleration.
- High reliability.[3]

Fig. 2: 3D Model of prototype

5. FORMULAE

a. Total thrust generate

$$T = \frac{\pi}{4} D^2 \rho v \Delta v$$

T=thrust [N]
D=propeller diameter [m]
v=velocity of air at the propeller [m/s]
Δv=velocity of air accelerated by propeller [m/s]
ρ = density of air [1.225 kg/m³]

b. Total hover produce (Lift)

From the engine rpm we can able to calculate the angular velocity of the engine propeller. Angular velocity:[5]

c. Total Drag force:

Drag acting on the blade due to air stream

$F_{Drag} = \frac{1}{2} * V_b C_d \rho A$

Where,

C_d = coefficient of Drag =0.5

6. ADVANTAGES

i. It can use for search and rescue operations.
ii. It has the ability to carry supplies if extraction is impossible.
iii. The hover bike would be able to reach some areas inaccessible to road vehicles and helicopters.
iv. The response time would be much quicker than a helicopter, and could save many lives.
v. It does not need any runway.

7. APPLICATIONS

i. Used in Policing duties
ii. Can be used Traffic spotting
iii. Sports events film coverage
iv. Aerial photography
v. Surveillance of coastal borders, road traffic, etc.
vi. Disaster and crisis management search and rescue
vii. The full scaled model could be used as a future mode of transportation

8. CONCLUSIONS

Hover Bike is a new, fun & safe mode of transport that virtually anyone can drive. Adventurous motorcyclists might be familiar with the thrill of getting airborne at the top of a rise, but the Hover bike is set to take catching some air to a whole new level. . The designed light weight Hover bike could effectively achieve lift and stability during flight.

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