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YANTRA (Yuktah Autonomous The Robotic Aviator)

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ABSTRACT

This paper discusses the modeling of YANTRA (Yuktah Autonomous the Robotic Aviator) for defence surveying and spying purpose. An autonomous drone is a category of drone that does all the work."A car that drives itself". An autonomous drone (HOVERBIKE) is practically the same concept. The entire drone, very little manual work on your part. It has custom route mode going. They literally do all of the work so you can sitback, relax, and have a good time. the main purpose of the flight controller is to perform a petrol function between given GPS coordinates while maintaining a specified altitude for an assigned time and then return to its launching position without any human interaction.

Keywords— *Yantra, Hoverbike, Autonomous drone, GPS, Telemetry*

1. INTRODUCTION

A Yantra can be defined as a combination between a motorcycle and a helicopter proposed electronically. Ideally, this vehicle would able to allow people to navigate the world in a new individual way. A well-designed Yantra would be able to take off and land vertically slowly through tight spaces and hover in place. Till date, no commercially useful Yantra has been built, though some test prototypes are in the developing stage.

We combined the ease of motorbike and the freedom of a helicopter to create the world's first flying Yantra. Modelling of a YANTRA for defence surveying and spying purpose. It is a compact aerial vehicle configuration which is able to spy and survey the surroundings and also a simple design which is used for commercial purposes just like a motorbike.

2. LITERATURE REVIEW

The original Yantra was made by Chris Malloy of New Zealand. This project started as a hobby, but quickly developed into commercial use, with interest from people of groups such as universities, farmers, search and rescue, private and military.

3. DESIGNING

The main goal of the design was to develop a lightweight frame, mount an engine with propellers on the surface, and implement a drive system for rotation of propellers and achieve a lift to the system. This design considers manoeuvrability, minimization of weight, alternative forms of propulsion, and overall flight stability of Yantra. We have used ANSYS and CATIA software for designing and analysis of Yantra.

4. COMPONENTS USED

- **(a)** Frame
- **(b)** Dc Motor
- **(c)** Power Distribution Board
- **(d)** APM Controller
- **(e)** Electronic Speed Controller (ESC's)
- **(f)** Li-Po Battery
- **(g)** Receiver and Transmitter
- **(h)** Telemetry
- **(i)** GPS
- **(j)** Propellers
- **(k)** Camera
- **(l)** Servomotor
- **(m)** LCD Panel
- **(n)** Ardu Pilot Software
- **(o)** Laptop

4.1 Frame

Figure 1 shows the frame of Yantra and is made from G10 material. The dimensions of the frame are as shown in figure. It is made from G10 for centre chassis and aluminium for 4 rings.

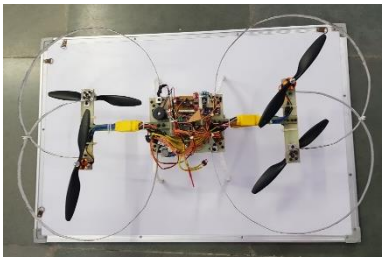

Fig. 1: Frame

4.2 DC Motor

All the 4 motors are mounted on the frame on their respective positions. Two motors are placed as for face upwards whereas others towards downwards. Figure 2 shows the BLDC motor.

Fig. 2: Dc Motor

4.3 Power Distribution Board

The Power Distribution Board (PDB) is placed at the centre of the frame. PDB is attached to the frame by using the screws as shown in figure 3.

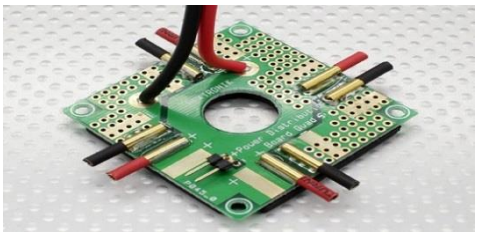

Fig. 3: Power Distribution Board

4.4 APM Controller

The APM 2.6 board requires no assembly and is ready for firmware. It has no onboard compass, and it is optimized for vehicles where the compass is placed far from power and motor sources to avoid magnetic interference.

Fig. 4: APM Controller

4.5 ESC (Electronic Speed Controller)

Electronic speed control or ESC is an electronic circuit whose purpose is to vary motor's speed, direction and possibly also to act as a dynamic brake.

Fig. 5: ESC

4.6 LI-PO Battery

A lithium polymer battery is a rechargeable battery of lithium-ion technology using a polymer electrolyte instead of a liquid electrolyte. High conductivity semisolid polymers form this type of electrolyte. These batteries have high specific energy than other lithium battery types and are used in applications where weight is a critical feature, like mobile devices and radio-controlled type aircraft.

Fig. 6: Li-Po Battery

4.7 Receiver and Transmitter

The FS-i6X transmitter and FS-iA6 receiver constitute a 6-channel 2.4GHz AFHDS 2A digital proportional computerized R/C system. It is used in fixed-wing and in helicopters.

Fig. 7: Receiver and Transmitter

4.8 Telemetry

FrSky telemetry allows us to display Ardu Pilot software information such as flight modes, battery level, and error messages, as well as information from additional FrSky sensors on the Laptop.

Fig. 8: Telemetry

4.9 GPS

It is a type of satellite-based radio navigation system. It provides information about the position and time to the GPS receiver unless there is any obstacle between the line of sight to four or more satellites

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Fig. 9: GPS

5. MISSION PLANNING

5.1 Auto Mode

The mission planning in auto mode in APM controller is done by automated missions that will run when it is set to AUTO mode.

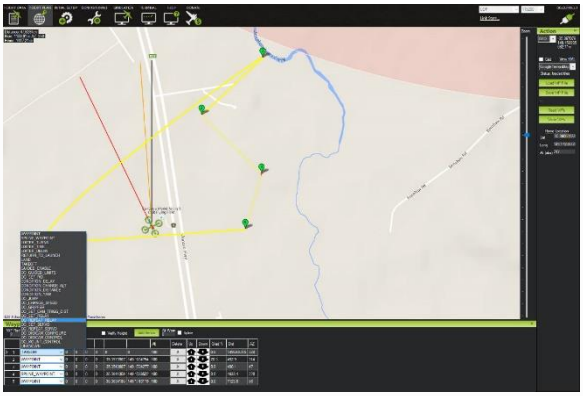

Fig. 10: Auto Mode

5.2 Mission Planner Mode

In the screenshot below, a Yantra mission starts with an auto takeoff to 20 meters altitude and then goes to WP 2 rising to 80meters altitude on the way, then waits for 10 seconds and then the craft will proceed to WP 3 then returns to launch. Since the default altitude is 80 meters, the return to launch will be at 80 meters. After reaching to its position, the yantra will land.

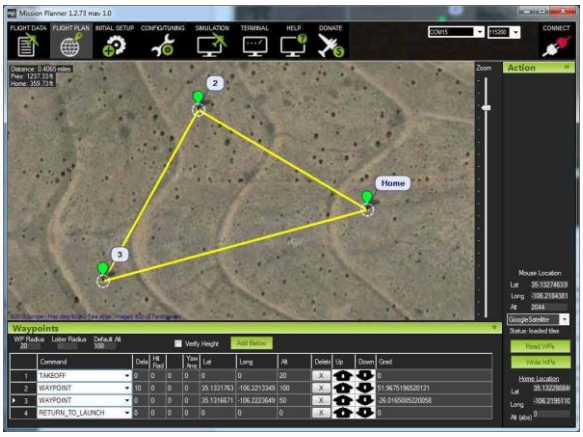

Fig. 11: Mission Planner Mode

5.3 Altitude Hold Mode

In altitude hold mode, Yantra maintains a consistent altitude allowing roll, pitch, and yaw which is controlled normally. When altitude hold mode (Alt Hold) is selected, the throttle is automatically controlled. Roll, Pitch and yaw operate the same as in stabilize mode.

Fig. 12: Altitude Hold Mode

5.4 Posh old Mode

The PosHold flight mode is a new mode for APM controller. It is similar to Loiter which means that the vehicle maintains a constant location, heading, and altitude of Yantra.

Fig. 13: Poshold Mode

6. CONCLUSION AND FUTURE SCOPE

The conclusions that can be drawn from the fabrication of Yantra were fabricated successfully as per the concept. Yantra is capable of working under different conditions. Sudden movements like turning towards left or right could be achieved. The yaw, pitch, roll at higher altitude (nearly 500 m) could be achieved.

With further developments, the applications of the "YANTRA" can be improved like Cloud Seeding by assembling necessary equipment. Geographical pictures by installing high-resolution cameras. Underwater detection instant postal and courier delivery. Providing food, life jackets and medical help during natural calamities. Used for reconnaissance by the military.

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