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Design and Fabrication of Drones for Medical Purpose

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Abstract- The designing medical drone that will help the people who are at emergency. Many people died due to lack of proper medical care or medical service. Suppose if a person is met with an accident and admitted in a hospital. There is requirement of blood but the hospital doesn't have the stock. They need to bring blood from nearby blood bank which is far of 1km.In this case "the medical drone will provide facility to the hospital". Here the drone is packed with 1litre of blood as a payload and the waypoints of the route is dumped into the APM(Ardu mega board).We will turn on the auto mode on the transmitter then the medical drone will takeoff and loiter at the destination, later it will be coming back to the launched location

Keywords: **Medical Service, Blood, Accident, Payload, APM, Waypoints.**

I. INTRODUCTION

Drones have the ability to gather real time data cost effectively, to deliver payloads and have initiated the rapid evolution of many industrial, commercial, and recreational applications. Unfortunately, there has been a slower expansion in the field of medicine. This article provides a comprehensive review of current and future drone applications in medicine, in hopes of empowering and inspiring more aggressive investigation.

Drones are referred to as any small unmanned aerial vehicle that is remotely or automatically controlled. There are many types of drones, but the two main designs consist of rotary-wing drones or fixed wing drones, both of which have advantages and disadvantages. Drones are very small and land and take off with very little need for clearance. Overall, current drone technologies can be understood by examining UAV classification, definition and applications in various fields. This includes the analysis of each respective operating system, various sensors and routing systems. According to the National Defense University's Library, a drone is any "land, sea, or air vehicle that is remotely or automatically controlled". Drones have various purposes and are currently used by the United States Government in the private sector for purposes including "investigation of agricultural crops, observation of weather, relay broadcasting and communication, investigation of the extent of damage during disasters, recognition of traffic flow, and unmanned security". There is a wide range of potential drone applications that may be optimized through a better understanding of the use of UAVs. Therefore, the engineering principles involving drones must be reviewed.

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II. LITERATURE REVIEW

Medical drone will be flying from one location to other location with in less time. A person will be sitting at the distribution center and monitoring the activities of the drone. When he/she gets information about the emergency situations then he/she will be launching the medical drone from the location to the destination. The employee will be setting the location like waypoints in the mission planner software and dumping it into the drone. Medical Drone is launched from a point 1, which is also called as Takeoff point. There are sub-waypoints whichwaypoint1, Waypoint2, Waypoint3. Loiter, Landing. Drone will be following the waypoints like takeoff, loiter, landing. When the drone is following the waypoints, at the loiter point the drone will be holding the position for some time, with the help for servo we will be dropping the payload slowly on to the ground. Again it will come back to Launchpad.

COMPONENTS

To design of medical drone, we are using different components.

- Aluminum Frame,
- Brushless DC Motors,
- Electronic Speed Controller's,

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- Power Distribution Board,
- Battery,
- Global Positioning System

MOTORS

- Practically all the latest drones use a brushless electric "out runner: type, which is more.
- Reliable, and quieter than a brushed motor.
- Motor design is important. More efficient motors save battery life and give the owner more flying time which is what every pilot wants.

MOTOR MOUNT

- Sometimes built into combination fittings with landings struts or can be part of the UAV frame.

LANDING GEAR

- Drones which need high ground clearance may adopt helicopter style skids mounted directly to the body, while other drones which have no hanging payload may omit landing gear altogether.
- Many fixed wing drones which cover large distances such as the Sensefly eBee, Trimble UX5 or the 3DR Aero-M don't have landing gear and land perfectly fine on their belly.
- Most drone has a fixed landing gear. However, the best drones will have retractable landing gear giving a full 360-degree view.

MAIN DRONE BODY PART

This is the central hub from which booms radiate like spokes on a wheel. Electronic Speed Controllers are an essential component of modern quadcopters.An electronic speed controller or ESC is an electronic circuit with the purpose to vary an electric motor's speed and its direction .It converts DC battery power into 3-phase AC for driving brushless motors.

THE FLIGHT CONTROLLER

Input from receiver, GPS module, battery monitor, IMU and other onboard sensors. Controls autopilot, waypoints, failsafe and many other autonomous functions. It's central to the whole functioning of your UAV.

GPS

GPS stands for Global Positioning System. It is an American standard which provides location and time information in all-weather condition. PS receiver and magnetometer to provide latitude, longitude, elevation. Device. GPS is an important requirement for waypoint navigation and many other autonomous flight modes.

RECEIVER

Standard r/c radio receiver unit. The minimum number of channels needed to control a quad is 4, but 5 is usually recommended. There are many manufacturers of receivers on the market if you are building your own drone.

BATTERY

Lithium polymer (LiPo) batteries offer the best combination of energy density, power density, and lifetime on the market.

PROPS

The Pusher props are at the back and push the UAV forward hence the name "Pusher props". These contra-rotating props exactly cancel out motor torques during stationary level flight. Opposite pitch gives downdraft. Again, can be made of plastic with the better pusher props made of carbon fiber.

III. COORDINATE SYSTEMS AND QUADCOPTER THEORY

The quad copter is navigating in a three dimensional space. The BODY coordinate system (denoted 'b') is a moving coordinate frame fixed to the quadcopter, with origin ob in the middle of the aircraft as seen in figure1. The x-axis is defined to be pointing towards one of the motors, the z-axis pointing out the bottom of the quadcopter and the y-axis complete the right handed orthogonal coordinate system. An illustration of this is shown in Figure1.

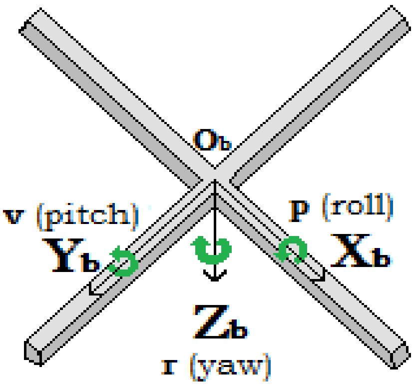

Fig 1: The quad copter with its BODY coordinate system

IV. WORKING OF MEDICAL DRONE

Drones make it possible to deliver blood, vaccines, birth control, snake bite serum and other medical supplies to rural areas and have the ability to reach victims who require immediate medical attention within minutes, which in some cases could mean the difference between life and death. They can transport medicine within hospital walls and courier blood between hospital buildings, as well as give elderly patients tools to support them as they age in place. UAS offer a variety of exciting possibilities to the health care industry, possibilities that help save money as well as lives.

"Drones are going to decrease the reliance on human beings that provide care and decrease the cost of assisting people," said Dr. Jeremy Tucker, vice president patient safety and regional medical director at MEP Health. "Being able to cross long distances at faster speeds to deliver blood products and lab samples also is a huge benefit. Now transporting blood products between hospitals, for example, involves vehicles on the ground that are prone to accidents and delays. Drones can help decrease those incidents."

The opportunities are there, which is why researchers, manufacturers and non-profit organizations are

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starting to look to UAS to provide applications that boost efficiencies and improve medical outcomes.

V. MISSION PLANEER SOFTWARE USED

ArduPilot is an open source, unmanned vehicle Autopilot Software Suite, capable of controlling autonomous: Multirotor drones. The ArduPilot software suite consists of navigation software running on the vehicle along with ground station controlling software including Mission Planner. Fully autonomous, semi-autonomous and fully manual flight modes, programmable missions with 3D waypoints.

Flight modes: Stabilize, Alt Hold, Loiter, RTL (Return-to-Launch), Auto, Acro, Auto Tune, Brake, Circle, Drift, Guided, Land, PosHold (Position Hold).

Providing communities with essential health care is no easy task. Medical professionals from emergency responders and third world aid workers to time-stressed staffers in large hospitals face a host of challenges every day—challenges unmanned aircraft systems, or UAS, can help overcome.

VI. PROBLEMS WHICH AFFECTS THE DRONE

- Medical drone mainly depends upon the weather conditions
- We need special permissions to fly the medical drone at the monuments.
- Proper delivery cannot be done in festival seasons.

The objective to control a quadcopter is a complicated task, composed of many processes and sensor measurements. There are numerous errors that can occur, some are crucial, while others can be handled such that the quadcopter can continue with its flight. In this chapter we will explore some of the errors and our strategies for detecting and handling the errors.

VII. RESULTS AND DISCUSSIONS

The following recommendations are influenced by the nature of moving towards increased manufacturability and sustainability for future prototypes. The process in which the Medical UAV is manufactured is not optimal. In this respect, future designs of the device should consider ease of manufacturability. Fortunately, the components such as the battery, brushless-motors, Arduino- Uno, and GPS module are all items that are easy and cheap to acquire. Despite this, these parts do not all come from the same source, and they create a lot of components that must be fit together to create the final working prototype. In order to make this device easier to manufacture, it could be designed and sold as a kit that comes in parts in a box. This kit would include all parts for assembly.

Connecting wires would be soldered to ensure circuit connection and can be contained within the body of the UAV in a protective unit – perhaps waterproof.

Additionally, the consideration of alternative power supplies and charging modules would be of benefit since the current battery is very large and bulky. The potential for solar power implementation should be considered to give the prototype charging capabilities. The payload, when delivered should come with a concise, simple instruction manual with visuals to show how the patient is to use the containing elements. The payload should be further investigated for reusability. Perhaps the medical UAV delivery system involves dropping a biodegradable payload. This would not only be environmentally friendly, but will also reduce the amount of time it takes the drone to drop the package and continue to its next delivery. Other improvements and future work include improving the mechanical and biomedical designs implemented in the current UAV. Additionally, the future team should consider a fixed wing design to increase the distance that can be travelled. Furthermore, adding a GPRS to use instead of using a Bluetooth module will enable long distances to be travelled

Table 1.Parameters and their values

S.No	PARAMETERS	VALUES
1.	Range	1km-1.2km
2.	Tested altitude	500m
3.	Safe altitude	200m
4.	Max speed	40 kmph
5.	Safe speed	18 kmph
6.	Min Payload	300 grams
7.	Max Payload	900 grams

Fig 2: Frabricated of Medical Drone

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Fig 3: Frabricated of Medical Drone

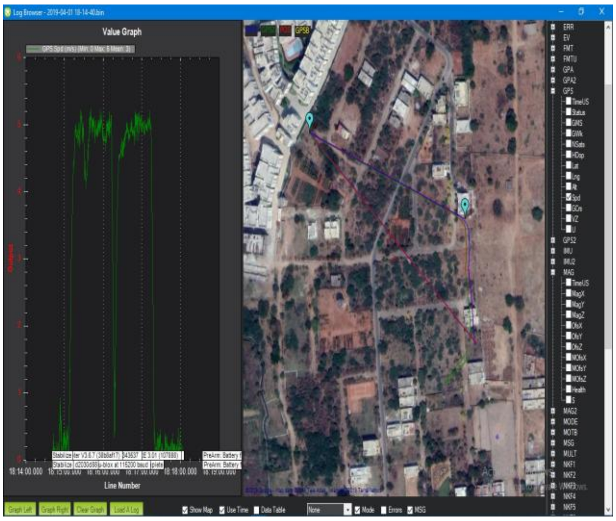

Fig 4: Way point's setup-01

Fig 5: Way point's setup-03

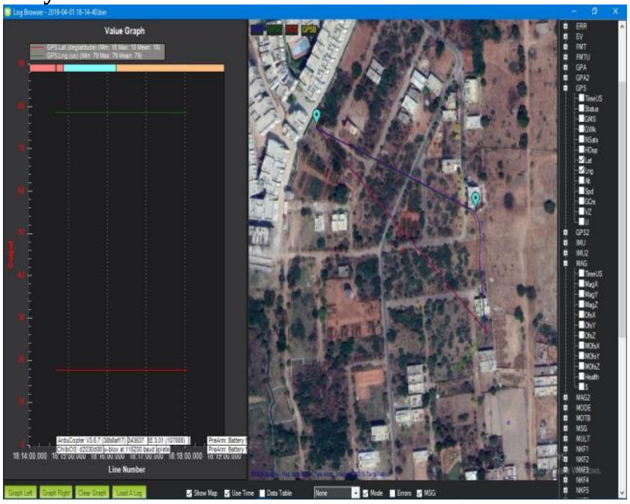

Fig 6: Way point's setup-02

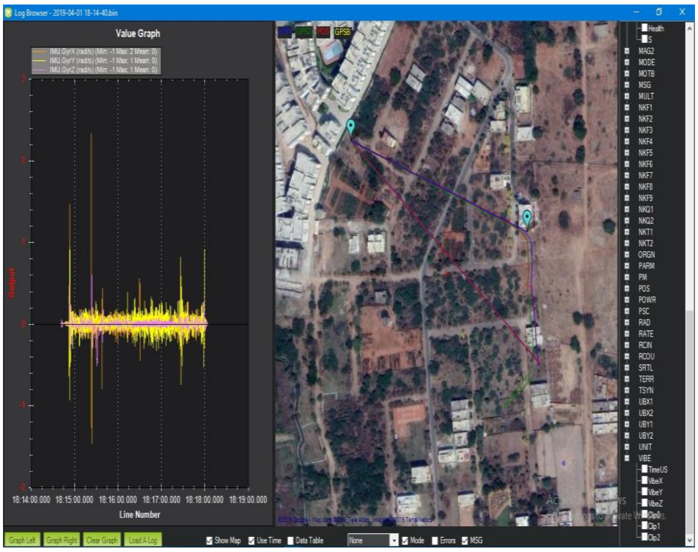

Fig 7: Way point's setup-04

VIII. CONCLUSION

Overall, the basis of this project was to apply engineering principles and design concepts to drones, medicine and biology to improve healthcare accessibility. Through the design of a UAV, arm and payload, the transportation of medical and biological components is feasible. The use of UAVs for medical supply delivery will alleviate suffering and provide many citizens with the chance to recover from illnesses. In fact, research shows that “70.3% of people who need hospitalization had failed to be hospitalized because of the economic difficulty that doing so incurs”. Medical supply delivery will significantly reduce the number of people who need to be hospitalized and, therefore, reduce the overall percentage and cost of medical services that comes with hospitalization.

In summary, there are many different medical needs across the remote areas therefore, to adequately address the various needs there must be a medical drone network implemented to provide various supplies to people in remote areas. These supplies include blood, medicine, and portable medical

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equipment. Implementing a medical delivery system via UAVs would be helpful to an enormous magnitude of people.

In conclusion, this project provided insight on the feasibility of the goals set out to be accomplished. The team successfully designed and built a drone with an arm attachment to enable the transportation of medical supplies. Thus, the design and testing of the semi-automatic UAV successfully demonstrated the concept feasibility of implementing medical supply delivery drones in the healthcare.

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