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Medicine Supply and Camera Surveillance in Isolated Areas Using Micro Air Vehicle

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Abstract: Air transport plays a significant role in supply of various goods. It is used for the carriage of goods e.g. medical supplies. Its role gained particular importance when the covid-19 pandemic led to a drastic decline in air operations. In response to the crisis, many air carriers temporarily converted passenger aircraft to freighter aircraft. Using of airways in such emergency situation can be beneficial as transportation becomes easier, faster and can cover longer distances in short time. In addition to transportation of goods, airways can be also used during natural calamities like flood and for mapping. The future use of planes in healthcare also is very thought provoking. How can the industry best use this technology to improve safety and care delivery? Well for starters, planes already have been trialed to deliver food aid and medical supplies to areas hit by disaster, such as Haiti, by a start-up called Matter net. The rapid delivery of vaccines, medications and supplies right to the source could quash outbreaks of life-threatening communicable diseases. Communication equipment, mobile technology, portable shelter comprises the vast list of what could be delivered in a rapid fashion to areas where critical infrastructure damage would prevent ground or typical air transport.

Keywords*:* GSM Module, Arduino, ESC, BLDC Motor, Servo Motor, Camera, Receiver.

I. INTRODUCTION

Medical supplies transport is a quite critical task. There is a huge variety of medical tablets, vaccines, syrups, devices and parts. There usually is an urgency of certain medical supplies at certain locations as per emergencies. To allow for instant transport of medical supplies from medical stores to hospitals and emergency centers, we here design a medical supply delivery airplane. The plane will allow for instant delivery of medical supplies to hospitals and emergency centers without being affected by traffic in the area. The Medical delivery drone offers a wide variety of advantages including:

- Carry Medical Supplies – Tablets, vaccines, devices, medical tools etc
- Plane designed for stable flight with Supplies
- Perforated Medical Supply Box for Easy Filling
- On Board Live Camera for Effective Control

The plane achieves flight as per the user's commands using remote controller wirelessly. The camera mounted on the plane is used to transmit live footage back to the user that helps user in flying the plane from over a distance. The plane can be used for rooftop to rooftop deliveries between medical stores and hospitals within 1 kilometers of range using this plane.

This form of automatic plane delivery system can save precious lives in emergency scenarios where the current transportation structure is shattered due to floods, earthquakes, and so on. This project can be beneficial not just in rural areas, but also in fully developed cities. The developed and fast moving cities are majorly bothered with slow moving traffic jams. In India, there are many cases reported where the late delivery of medicines to any health organization proved to be very fatal, therefore this medicine delivery project will come handy in case of efficient delivery of medicine in the cities where traffic congestion and bad conditions of road become a major drawback in all the above mentioned situations.

II. BASIC METHODOLOGY

This system consist of mainly Arduino, GSM module, receiver, BLDC motor, ESC, Camera, battery, servo motor, remote. The receiver has 6 output channels. The first channel is connected to ESC. BLDC motor is connected to ESC which is further connected to propeller and camera. The second channel is connected to the rudder. The third channel is given to aileron of the plane. At aileron two servo motors are connected for left and right movement. The fourth channel is connected to the elevator and fifth channel is given to drop. There are three inputs to the receiver namely video transmitter, remote transmitter and power supply. There are total five servo motors used.

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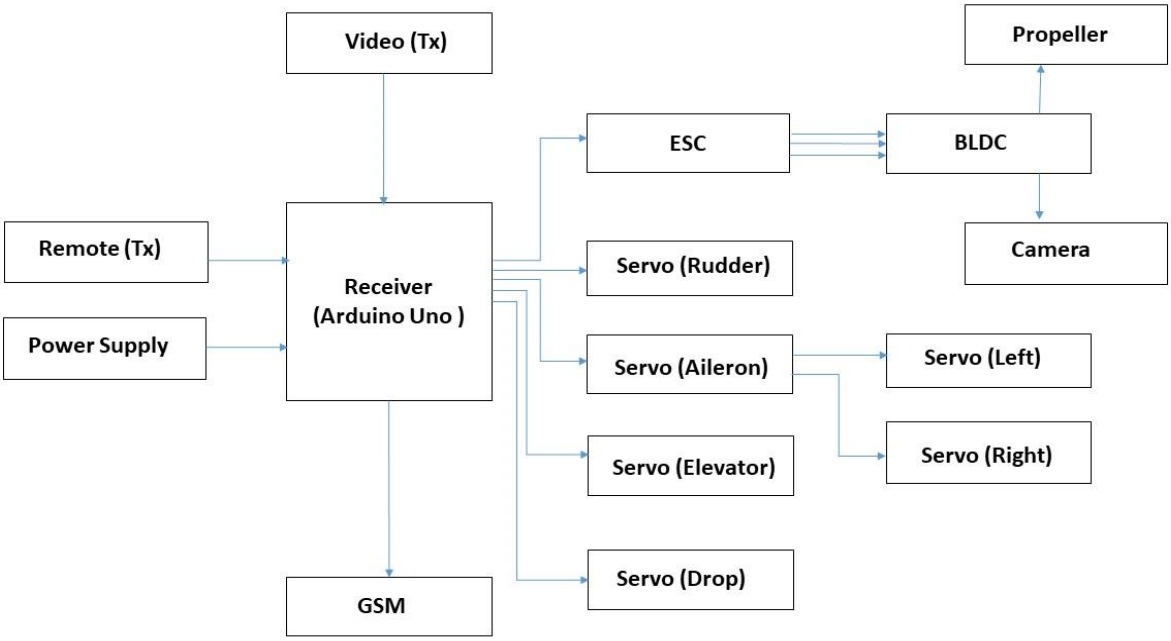

Fig. 1 Flowchart of working mechanism

We are going to use GSM modem that works on wireless network. GSM modem supports extended commands such as reading, writing and sending SMS, searching phone book entries etc. Also Arduino is used as a controller which is an open source. The receiver receives a message containing information about where the medicine is required and what are the list of medicine like blood units, vaccines, tablets etc. These are uploaded into the payload after which the plane is launched and controlled by remote.

When we start to operate, the joystick of the remote is used to control the servo motors which are used to give directions to the flaps of the plane . The battery gives power supply to ESC. When ESC is triggered it drives the BLDC motor.

Therefore, the motor gets on and the fans start rotating and moves in forward direction. As the destination address is already given to the plane, it goes to the desired location and delivers the medicine by means of parachute. Servo motor is used to drop the medicine at location and it reaches to the customer. Surveillance and mapping of the whole process is done using the camera.

III. LITRATURE REVIEW

Sr. No	Project Name	Author Name	Date of Publish
1	Current state of aerial vehicle in healthcare :challenges and opportunities.	T.Amukele	2019
2	Covid 19 and emergency planning	G.Winter	2020
3	Unmanned Aerial vehicles applications in future smart cities	N.Mohamed,J.Al-Jaroodi,I.Jawhar,Etal	2020
4	Use of unmanned aerial vehicles for medical product transport.	C.A.Thiels,J.M.Aho,S.P.Zitlow	2015

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IV. PROBLEM DEFINATION

1. Care of trauma casualties in an austere environment presents many challenges particularly when evacuation is not immediately available.
2. Without camera surveillance we cannot ensure accurate delivery.
3. Hence we hypothesized this project which would successfully deliver life-sustaining medical supply to a remote denied environment where vehicle or foot traffic is impossible or impractical.

V. WORKING

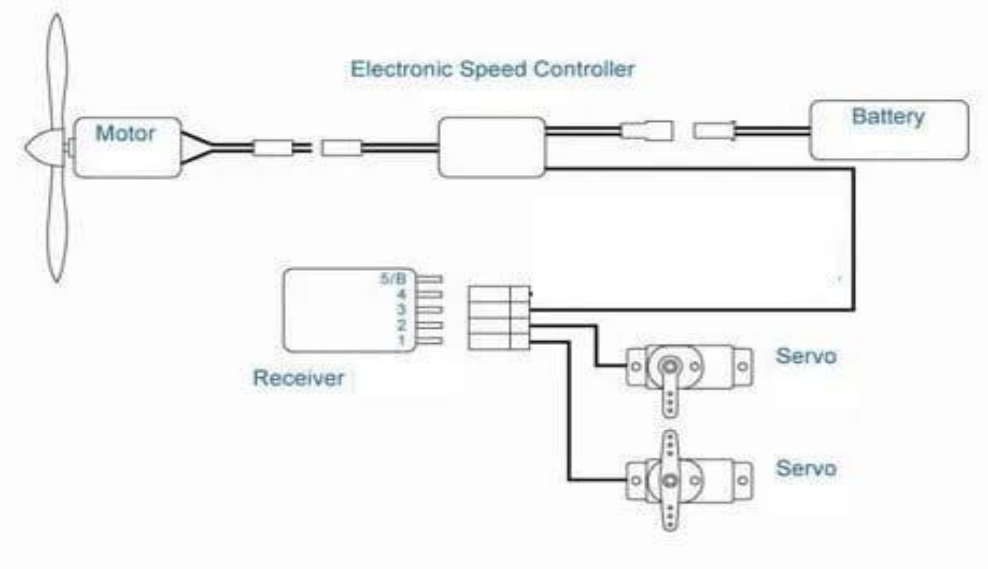

Fig. 2 Block diagram of plane.

1. Receiver consist of 6 channel controller in which 3rd is throtal and it is connected to Electronic Speed Controller. 1st and 2nd channel connected to Servo motor. 5th and 6th channels are used to pick up and drop.

2. Power supply drives ESC .

3. Joystick controlles operation of servo.

4.Servo decides direction of flaps of plane.

5.When ESC triggered BLDC motor gets on fan of motor starts moving then planegoes in forward direction.

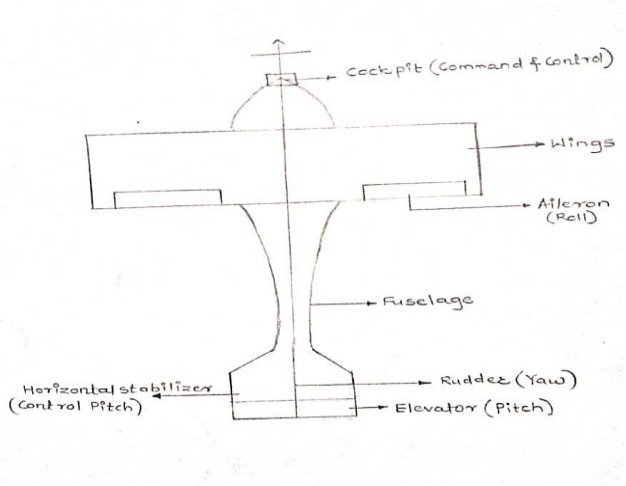

Fig. 3 Labelled diagram of plane.

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VI. CALCULATIONS

Here we are going to calculate dimensions of each part of plane. This is done by using the formula

Cube load= weight/surface area

What Is Cube Loading?
Cube Loading (CL) is a value that provides a consistent comparative numeric value, which can be used as a general indicator of the flying characteristics of a model radio controlled airplane. CL is not dependent on size. This size independence makes it easier to understand the overall "flyability" of any RC plane, and serves as a reliable index of the pilot's skill level needed to fly it successfully.

Fig. 5 Cube loading range.

- The plane we are going to make is a glider . So the standard cube load for gliders is from 1 to 6.The cube load we have chosen is 6.
- For the calculation of wing dimension ,the desired ratio of breadth(B) to length(L) is 1:6. So first we have to assume one of the parameter.
- We assumed B=25cm. Therefore length of wing will be 6x25=150cm.
- Considering all the components we are going to use in the plane along with the payload the total weight of our plane is 1.5kg.
- Surface area of wing= Length x Breadth = 150 x 25= 3750 cmsq
- CG= 30% of Breadth= 30% of 25=7.5 cm.
- Fuselage= 60% of wing span = 60% of length=90cm.
- Now we calculate the dimensions of rudder. The rudder has a standard area in between 350-450 cmsq. We have to calculate the area so that the total surface area=350-450 cmsq
- By assuming values of X2, Y, Z. We get,
- Area of triangle = ½ x X2 x Y=1/2 x 4 x 30= 60cmsq
- Area of rectangle= Y x Z=30 x 12= 360cmsq
- Therefore, Area of rudder= Area of triangle + Area of rectangle=60+360=420cmsq

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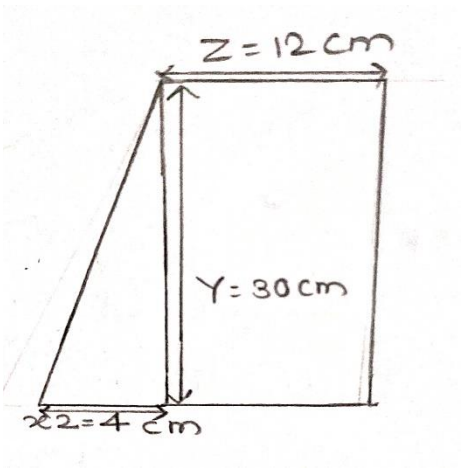

Fig. 6 Dimensions of rudder.

VII. WING SPAN

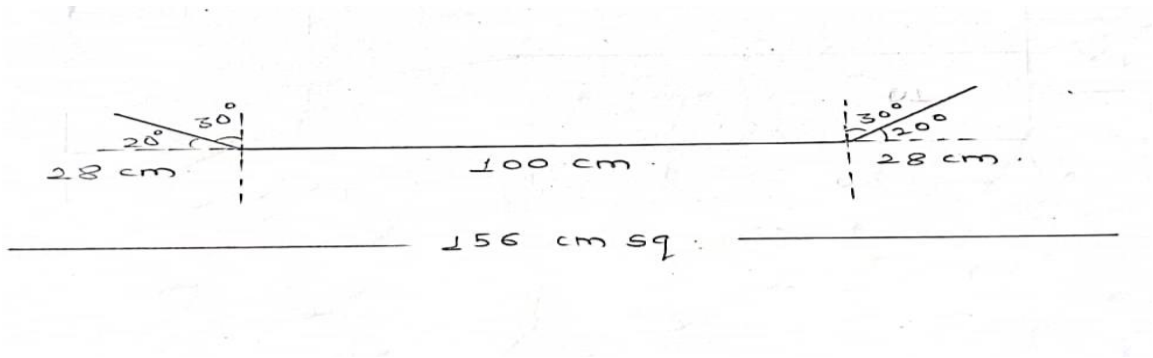

Fig. 7 Dimensions of wingspan

- The wingspan of plane is always measured in a straight line, from wingtip to wingtip, independently of wing shape.
- The material we used to make the plane is corrugated plastic boards.
- The total length of wing we have considered is 156 cm.
- During flight time, because of the pressure of the air on wing the drag is created.This will affect the stability of plane.
- To avoid this, both the ends of the wing are bended through certain angle 20º.
- $\cos 20^\circ = x/30$
  $x = 28\text{cm}$
- For mounting the wing on fuselage, we should consider centre of gravity of wing. The CG of wing is obtained by taking 30% of breadth of the wing. Hence CG= 30% of breadth of wing= 30% of 25= 7.5cm.
- **Fuselage :**

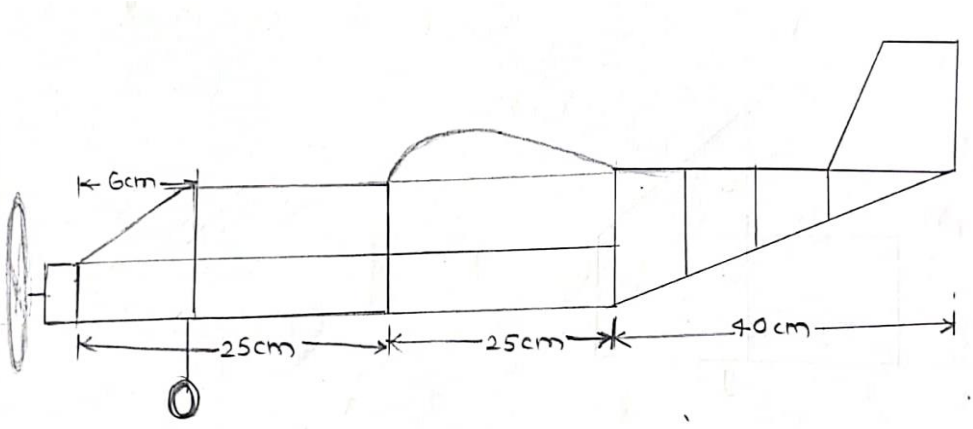

Fig. 8 Dimensions of fuselage.

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- The fuselage is a long hollow tube which holds all the pieces of an plane together.
- The fuselage is hollow to reduce weight. All the electronic components are mounted on fuselage.
- The length of fuselage must be nearly equal to the 60% of wingspan.
- Fuselage = 60% of wingspan= 60% of 156 = 90 cm (approx.)
- So we are taking 90x30 cm corrugated plastic sheet of 3mm width.

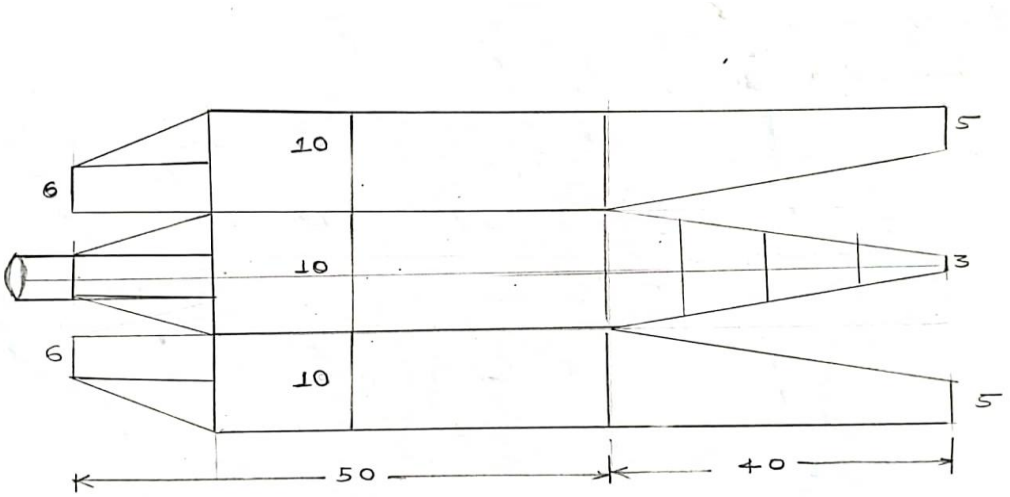

Fig. 9 Dimensions of fuselage

VIII. ELEVATOR

- Elevators are flight control surfaces situated at tail part of plane.
- Both the horizontal stabilizer and elevator contribute to pitch stability.
- Elevators move up and down simultaneously.
- An increased downward force, produced by up elevator, forces the tail down and nose up.
- A decreased downward force at the tail, produced by down elevator, causes the tail to rise and nose to lower.

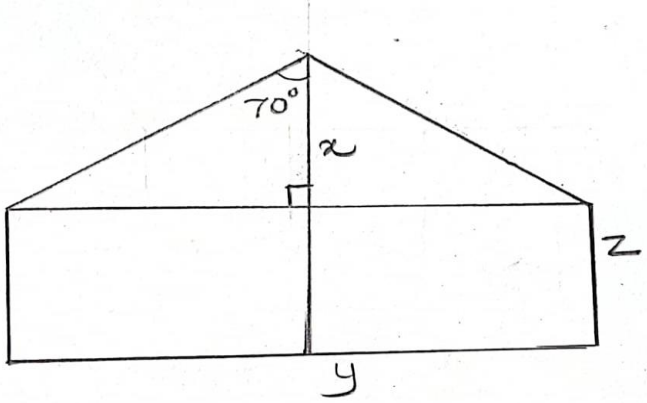

Fig. 10 Dimensions of elevator.

IX. MOUNTING OF COMPONENTS

- First the camera, propeller are interconnected to BLDC motor.
- ESC is the electronic speed controller having three wires which are connected to BLDC motor.
- The main function of ESC is to trigger BLDC motor due to which motor goes to the on condition and results in rotation of propeller.
- This causes the forward and backward movement of plane.
- The power supply is given to the receiver which is also connected to video transmitter and Arduino uno.
- The output of receiver is given to servo rudder, servo aileron, servo elevator, servo drop and GSM.
- The controlling of all these electronic component is done by remote controller

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X. RESULT

XI. CONCLUSION

In pandemic situation effectively and inspired innovative ways of increasing access to testing and healthcare delivery to everyone including those in isolated areas of the country by this approach we become able to quickly save lives of general populaces. We are deliver the medicine at correct destination. It takes, less man power.it covers long distance in small period. Without contact with any person we can deliver medicine safely. Since we are mapping flood affected areas ,we can provide help to injured people.

REFERENCES

[1] Haowei Gu, Ximin Lyu , Zexiang Li , Shaojie Shen , Fu Zhang "Development and Experimental Verification of hybrid vertical takeoff and landing (VTOL) Unmanned aerial vehicle(UAV)" June 13-16 2017 ,International Conference on unmanned Aircraft Systems (ICUAS)

[2] .M.Prathilothamai, Parvathi Sanjana "Drone design for first aid kit delivery in emergency situation" 2020 6th International Conference on Advanced Computing and Communication systems(ICACCS).

[3] . A.Josephin Arockia Dhivya, R.J.Hemalatha , T.R. Thamizhvani, Josline Elsa Joseph , Binky Babu, R.Chandrasekaran" Medical Drone-A Life Saver in emergency situations

[4] Cornelius Thiels , Jonathon Aho "Use of unmanned aerial vehicles for medical product transport" Article in journal of air medical transport April 2015

[5] Mo Elsayed, Moataz Mohamed "UAV (Drone) delivery of medical supplies during covid-19 disruption:A white paper" March 2020

[6] A.Josephin Arockia Dhivya, R.J.Hemalatha , T.R. Thamizhvani, Josline Elsa Joseph , Binky Babu, R.Chandrasekaran" Medical Drone-A Life Saver in emergency situations, 2018, International Journal of Engineering and Technology.

[7] Pragati Jain , Ashutosh Rai, Bobby Budhwani "Medicine Delivery Drone" August 2020,International Journal of Engineering Research and Technologies(IJERT)/

[8] X. Lyu, H. Gu, Y. Wang, Z. Li, S. Shen, and F. Zhang, "Design and implementation of a quadrotor tail-sitter vtol uav," in 2017 IEEE International Conference on Robotics and Automation (ICRA). IEEE, 2017(Accepted).

[9] F. Zhang, X. Lyu, Y. Wang, H. Gu, and Z. Li, "Modeling and flight control simulation of a quadrotor tailsitter vtol uav," in AIAA Modeling and Simulation Technologies Conference, 2017