Journal of Current Research in Engineering and Science
Bi-Annual Online Journal (ISSN : 2581 - 611X)

Volume 7- Issue 1, January 2024
Paper : 85

Design and Fabrication of AutonomousOrgan Transportation Drone

Mr.E. Gangadurai[1], Dinesh Kumar M[2], Prem Kumar S[3] ,Lokesh Kumar N[4],Abilesh M[5]
[1]Assistant Professor, Department of ECE Velammal Engineering College, Chennai, India
[2]UG Students, Department of ECE Velammal Engineering College, Chennai, India
gangadurai@velammal.edu.in

ABSTRACT

From 2014 to 2019, nearly 2500 people have been ignored for their organ transplantation because of delays in transportation of nearly 1 to two hours. Our project deals with the layout, fabrication, testing and analysis of an independent organ transportation drone. The principle motive of our project is to skip the organ transportation thru airlines, From our mission we should save the precious life of a human within a short period of time. Our drone operations or missions will be carried out autonomously with pre-programmed operations. A clinical unmanned aerial vehicle is designed to deliver clinical supplies and payloads to and from extraordinary Points in controlled airspace. This research into provider development focused on a two-stage model of research and improvement. The carrier includes degrees of inquiry, clinical elements and lab sample transport, and then transplant organ and bulk tissue delivery. Constraints for secure use, privacy and statistics protection are closely related to the constraints used to define the provider. The machine provides an alternative to other autonomous transportation systems and saves lives. This study supports the idea that the resource is underutilized and calls for similar research and improvements.

1.INTRODUCTION

Unmanned aerial vehicle (UAV), sometimes known as a drone, is a type of aircraft which does not have a human pilot on board. UAVs are an example of an unmanned aircraft system (UAS), which consists of an unmanned aerial vehicle (UAV), a controller on the ground, and communication between the two. UAV flying can function with varying levels of autonomy, including both below It is possible to establish remote control either manually or using an onboard computer system. Initially, UAVs were utilised for tasks deemed to be "dull, dirty, or unsafe"for people. Its use is quickly spreading to economic, medical, leisure, agricultural, and other applications even though it started with navy projects. These include product delivery, aerial photography, agriculture, smuggling, law enforcement, peacekeeping, and drone racing. Army UAVs are now far outnumbered by civilian UAVs, with projections of more than 1,000,000 being purchased through 2015. This is done so that they can be identified as an early commercial application of self- sufficient concepts, as evidenced by the autonomous car and household robots.

The name "drone," which is now more often used, was initially used in connection with the Fairey Queen and de Havilland Queen Bee remote-flying target aircraft, which were used in the 1920s and 1930s for mock battleship gunnery practice[1].

As according their Roadmap for Unmanned Unmanned aircraft system (UAS) is a word that was coined by the Department of Defense (DoD) and Federal Aviation Administration (FAA) in 2005's Aircraft Systems 2005-2030.The International Civil Aviation Organization (ICAO) and the British Civil Aviation Authority have frequently utilised this phrase as part of a Unified-European Sky (SES) Air Traffic Manage (ATM) research (SESAR Joint Task) agenda for 2020. In addition to aircraft, other aspects are taken into account in this phrase. The system consists of ground manipulating stations, information links, and other help equipment. Unmanned aerial vehicles (UAVS), remotely piloted aerial vehicles (RPAVs), and remotely piloted aircraft systems can be contrasted over a comparable time span.[2],[3],[4] Similar expressions are frequently used nowadays. A UAV is described as a "powered,airborne car that doesn't deliver a human operator, employs aerodynamic forces to raise the vehicle, can fly autonomously or be piloted remotely, may be expendable or recoverable, and might carry a dangerous or nonlethal payload". Thus, because the missile itself is a weapon that cannot be used again, they are not regarded as unmanned aerial vehicles (UAVs). Even when it is unmanned and occasionally remotely guided, this capacity is stillavailable.

2.PROPOSED SYSTEM

We are trying to increase the payload weight and in our project, we are developing drones that are fully autonomous. As part of our project, we plan to increase the range and endurance of the device. As part of our project, we will provide a solution that will reduce the time required to transport organs for transplantation. Using a 913MHz telemetry module and WiFi to connect drone ground and air stations. Program the waypoint for autonomous operation or mission using mission planner software to provide GPS location for the drone. Pre-flight checks before takeoff are independent of our computers. Loading the organ or medical equipment into the drone. The arming

Journal of Current Research in Engineering and Science
Bi-Annual Online Journal (ISSN : 2581 - 611X)

Volume 7- Issue 1, January 2024
Paper : 85

operation is underway to get ready for autonomous flight. [6],[7]Set the flight mode to Auto to initiate the autonomous mission. The drone will follow the

waypoints to complete the mission and deliver the organ or medical equipment to the exact location indicated by the waypoints. After the completion of the mission, the drone will autonomously return to the ground station.

3.HARDWARE

SPECIFICATIONSARM

FABRICATION

The arm consists of hollow Aluminium rods (25 mm x 25 mm) with a 1 mm thickness. There are four arms which are at 90° respectively. Each arm will have a length of 500 mm. Each armwas welded using TIG welding forming a X-shaped structure. Two plates are placed on top and bottom of the arm. The plates are blunted in the frontal area. so as to reduce drag. The plates dimensions are 500 mm x 210 mm of thickness 1.2 mm. The plates are riveted onto the arms to reduce the vibrations caused by the plates.

Fig 1 Quad Frame

The landing gear was placed in such a way that it was angled at 30° to the base plate of the body. They are made of Aluminiumrods (25 mm x 25 mm) with a 1 mm thickness. The arms have a length of 600 mm.

Fig 2 Landing Gear

Placement Of Battery And Esc

The Battery is placed over the plate over which a compartment is created such that the Pixhawk Flight Control Board is placed properly. The ESCs are placed below the plates where a separate plate is welded towards the arms between the landing gears.

Fig 3 Electronic Speed Controller

Fig 4 Battery

Placement of Organ kit:

The first organ kit is placed beneath the body with help of Aluminium pipes of 25

Journal of Current Research in Engineering and Science
Bi-Annual Online Journal (ISSN : 2581 - 611X)

mm x 25 mm with a 1 mm thickness in the landing gears.

Fig 5 Brushless Motor

MT5120-290
KV Rating :
290Batteries :
6S Prop Size :
18"
Max Watts :
607.5WMax Thrust
: 3460g Weight :
231g

PROPELLER SPECIFICATIONS

Fig 6 propeller

Diameter: 13 inch
Pitch: 6 inch per
rotationMaterial:
Plastic No.of.blades: 4

Volume 7- Issue 1, January 2024
Paper : 85

PIXHAWK SPECIFICATIONS

Fig 7 pixhawk

The MEDICAL Drone's flight control board is a Pix hawk PX4 autopilot system. An open-source autopilot system called PX4 autopilot is designed for low-cost autonomous aircraft. Hobbyist use in small remotely piloted aircraft is made possible by their low cost and availability. The research, which began in 2009, is currently being used and further developed at the Computer Vision and Geometry Lab of the Swiss Federal Institute of Technology (ETH Zurich), with assistance from the Autonomous Systems Lab and the Automatic Control Laboratory. A remotely piloted aircraft can fly out of sight with the aid of an autopilot. Every piece of hardware and software is open-source and freely accessible to everyone under a BSD license. Autopilots with free software offer more adaptable hardware and software. Users can change the autopilot to suit their specific needs. Processor

FLIGHT CONTROLLER BOARD

The quad copter's "brain" is the flight control board. It contains the sensors that control how quickly each quad copter's

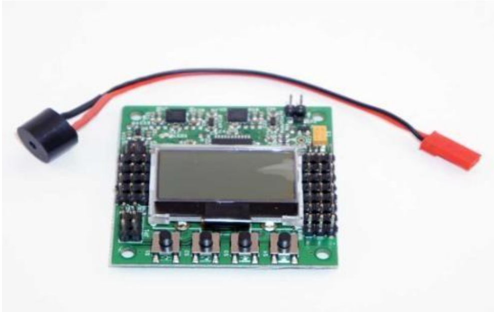

Fig 8 flight controller board

motor spins, including gyroscopes and accelerometers. Flight control panels can be xtremely simple or quite complicated. The Hobby King KK2.0 is a fantastic flight control board for novice quad copter builders.

RADIO TRANSMITTER AND RECIEVER

The quadcopter may be controlled using a radio transmitter and receiver. There are several types that work, but a basic quadcopter with the KK2.0 control board requires at least four channels. Radios with 4 to 8 channels are available, providing more flexibility for projects that may need for more channels down the road.

Fig 9 Radio Transmitter And Reciever

Journal of Current Research in Engineering and Science
Bi-Annual Online Journal (ISSN : 2581 - 611X)

Volume 7- Issue 1, January 2024
Paper : 85

TELEMETRY

Fig 10 Telemetry

It is small in size and light weight, so it can be placed in UAV very easily, and the receiver sensitivity is -120 dbm and the maximum transmit power is 100mW. It has high quality of USB to TTl chips.

GLOBAL POSITIONING SYSTEM

Fig 11 Gps

It provides position precision, tracks the location of the drone in satellite view, and updates the drone's position for the pilot for the range and distance of the flight from the source to the destination.

SOFTWARE REQUIREMENTS

MISSION PLANAR OR ARDUPILOT

In the mission planner software we can configure the flight control board and calibration of the drone. The software allows us to monitor the drone from the satellite view and fix waypoints. so by giving the instructions and preprogramming the drone before take off and the flight can fly autonomously.

CALCULATION

RPM(Revolutions per minute)

$Rpm_{(min)}$ = kv x Voltage input

= 522 x 14.4

$Rpm_{(min)}$ =7516.8

$Rpm_{(mac)}$ = kv x Voltage input

= 522 x 18.5

$Rpm_{(max)}$ =9657

Power Required

$(Power)_{min} = K_P \times D^4 \times p \times RPM$

$= 1.06 \times (1.0833)^4 \times 0.5 \times 7516.8$

$(Power)_{min}$ = 5486.60 watts

$(Power)_{max} = K_P \times D^4 \times p \times RPM$

$= 1.06 \times (1.0833)^4 \times 0.5 \times 9657$

$(Power)_{max}$ =7048.76 watts

ESC rating

$(ESC\ rating)_{min}$ = 1.2 x Max Current drawn by Motor

= 1.2 x 60

$(ESC\ rating)_{min}$ = 72A

$(ESC\ rating)_{max}$ = 1.5 x Max Current drawn by Motor

= 1.5 x 60

$(ESC\ rating)_{max}$ = 90A

Journal of Current Research in Engineering and Science
Bi-Annual Online Journal (ISSN : 2581 - 611X)

Volume 7- Issue 1, January 2024
Paper : 85

Thrust Required

$$(\text{Thrust})_{min} = [\frac{\pi}{2} D^2 \rho (P)^2]^{\frac{1}{3}}$$

$$= [\frac{\pi}{2} (0.3302)^2 \ X \ 1.225 \ (5486.60)^2]^{\frac{1}{3}}$$

$$(\text{Thrust})_{min} = 184.843 \text{ N}$$

$$(\text{Thrust})_{max} = [\frac{\pi}{2} D^2 \rho (P)^2]^{\frac{1}{3}}$$

$$= [\frac{\pi}{2} (0.3302)^2 \ X \ 1.225 \ (9657)^2]^{\frac{1}{3}}$$

$$(\text{Thrust})_{max} = 269.46 \text{ N}$$

Mass

$$\text{Mass}_{min} = \frac{Thrust}{g} = \frac{184.843}{9.81} = 18.842 \text{ kg}$$

$$\text{Mass}_{max} = \frac{Thrust}{g} = \frac{269.46}{9.81} = 27.467 \text{ kg}$$

Battery Capacity

5000mAh x 40C = 200A

Flight Time

$$(\frac{5}{60} \ X \ 60) + \frac{5}{60} + 60 = 20 \text{ mins.}$$

4.CONCLUSION

This project applies a solution in medical industry to deliver the organ in the early period of time. Our drone will fly autonomously with pre programmed operations so it will make easy to fly at exact location feed will pre processed to the GPS.So it will overcome the traffic and delay of time in emergency situation And then it will reduce the distance coverage in destination areaDrones are on the way, and they'll help lower the cost of carbon. In addition to relieving infrastructure of some of its burdens, the Department of Transportation should collaborate with NASEM and the Department of Education to hasten the development of disruptive technologies. In the era of artificial intelligence and big data analysis, drones are essential instruments for expanding multimodal transportation solutions since they can go where other vehicles cannot. There is a challenge of assimilation with this new area. In addition to being more affordable to build and operate than cars and aeroplanes, organ transplant transport Vehicles can concurrently cut non-hillable service costs, speed transport with less expensive infrastructure, and reach locations where other modes of transportation are unable to. A medical drone both saves lives and boosts local and regional economies. the introduction of standards

Fig 13 Autonomous organ transportation drone

Volume 7- Issue 1, January 2024
Paper : 85

REFERENCES

1. Abdul Basith J, Jayasree P. R, "A Reliable Control System for Unmanned Aircraft using Fault-Tolerant Control", *2022 Third International Conference on Intelligent Computing Instrumentation and Control Technologies (ICICICT)*, pp.638-644, 2022.
2. D. Sivabalaselvamani, D. Selvakarthi, L. Rahunathan, G. Gayathri, M. Mallesh Baskar, "Survey on Improving Health Care System by Implementing an Air Ambulance System with the Support of Drones", *2021 5th International Conference on Electronics, Communication and Aerospace Technology (ICECA)*, pp.878-883, 2021.
3. G Shanmugan Ganesan, Mastaneh Mokayef, "Multi-Purpose Medical Drone for the Use in Pandemic - Situation", *2021 IEEE Microwave Theory and Techniques in Wireless - Communications (MTTW)*, pp.188-192, 2021.
4. G Shanmugan Ganesan, Mastaneh Mokayef, "Multi-Purpose Medical Drone for the Use in Pandemic Situation", *2021 IEEE Microwave Theory and Techniques in Wireless Communications (MTTW)*, pp.188-192, 2021.
5. Rajendran, P.; Smith, H. Review of the Elementary Aspect of Small Solar-powered Electric Unmanned Aerial Vehicles. *Aust. J. Basic Appl. 8*, 252–259.
6. Zhao, A.; Zhang, J.; Li, K.; Wen, D. Design and implementation of an innovative airborne electric propulsion measure system of fixed-wing UAV. *Aerosp. Sci. Technol.* **2021**, *109*, 106357.
7. https://www.researchgate.net/publication/305273853_Drones_and_Possibilities_of_Their_Using
8. https://www.researchgate.net/publication/362908663_A_Short_Review_of_the_Drone_Technology
9. https://securewww.esat.kuleuven.be/cosic/publications/thesis-285.pdf
10. https://www.glyndwr.ac.uk/modules/Engineering%20and%20Applied%20Physics/ENG52N%20Drone%20Design%20and%20Construction.pdf
11. Papa U, Ponte S. Preliminary Design of an Unmanned Aircraft System for Aircraft General Visual Inspection. *Electronics*. 2018; 7(12):435. https://doi.org/10.3390/electronics7120435