

A Project Synopsis on

“FIRE EXTINGUISHER DRONE”

Submitted in partial fulfillment for the award of degree
of
BACHELOR OF ENGINEERING
in
ELECTRONICS ENGINEERING

Under the Guidance of
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CERTIFICATE

This is to certify that the “**JISHNU PISHARODY, PROBIR DE, ADITYA RATHOR & ABHISHEK SINGH,**” of the Department of Electronics Engineering, have submitted the Project Synopsis on “**FIRE EXTINGUISHER DRONE**” and are accepted and examined for the partial fulfillment of the Degree of Bachelor of Engineering in Electronics Engineering by the University of Mumbai.



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ABSTRACT

In a world where any destructive burning casualties are so frequent, the stalwart original askers continuously carry that risk factor with their lives to assist in helping humanity. In all soreness the history tells us that these brave individual beings do not survive utmost of the time. Handing over these dangerous tasks to the machines is vital as with inclusion of this factor the probability of losing numerous lives becomes less. One such effective device could be a controlled drone. It provides excellent mobility and does not involve any external labour force. Furthermore drones also can gather information at a more significant speed and functions responsibly. This paper aims to develop a drone quipped with a claw mechanism used in various fire extinguishing scenarios. Paper mainly focuses on giving a simple and cost efficient result for an independent aerial surveyor that can extinguish fire smoothly.

AIM:- To create an unmanned aerial vehicle that helps in extinguishing the fire.

OBJECTIVES:-

The fire safety objectives in this topic are:

- Reduce the risk to life caused by fire,
- contain, control, and suppress fire and explosion, provide adequate and readily accessible means of escape for survivors.

TABLE OF CONTENTS

<u>SR. NO.</u>	<u>TOPIC</u>	<u>PAGE NO.</u>
1	INTRODUCTION	8
2	LITERATURE SURVEY	9
3	BLOCK DIAGRAM & DESCRIPTION	10
4	ADVANTAGES & CHALLENGES	12
5	APPLICATIONS	13
6	CONCLUSION	14
7	FUTURE SCOPE	15
8	REFERENCES	16
9	PROJECT PROGRESS REPORT	17

LIST OF FIGURES

Diagram	Page No.
Figure 1: BLOCK DIAGRAM FOR FIRE EXTINGUISHER DRONE	10

INTRODUCTION

Drones are flying unmanned aerial robots that can be remotely controlled or made to fly autonomously through software-controlled flight plans in their embedded systems, working in conjunction with onboard sensors and GPS. The drones need to become intelligent and quick-witted to optimize industrial processes, maximize their utility, and are widely established in future factories. This technology offers various applications not only in fire protection and monitoring but also in surveillance operations. Fire departments are seeing a fantastic prospect of using drones during structure fires and rescue missions. In case of a structure fire, when the firefighters first arrive at the scene, the drone can be deployed to monitor the scene carefully before the firefighter personnel is put in harm's way. When equipped with a thermal camera, the drone can reveal the hotspots and see-through smoke in low light conditions. These infrared cameras allow operators to recon crew members and conditions, improving efficiency and safety. The drone can also be equipped with a spotlight to help firefighters in dark or low-light conditions. After the smoke has cleared, drones can also be used for critical evaluation of damage, whether from a fire or other natural disaster. Drones allow firefighters to scout out dangerous fires quickly and effectively and observe and monitor large blazes in the forests. This project aims to develop one such drone capable of performing both surveillance and firefighting operations.

LITERATURE SURVEY

One of the foremost preliminary steps for proceeding with any research paper is a detailed survey of various journals related to the selected topic. Herewith are some of the research papers that were studied:

Burchan et al. (2019). [1] demonstrated the use of Drone assisted wildfire fighting using fire extinguishing balls to supplement traditional firefighting methods. The proposed system was a hexacopter weighing 10 kg and balls of weight 0.5kg each. It consists of scouting unmanned aircraft systems (UAS) to detect spot fires and evaluating the risk of wildfire approach to the building.

Abdulla Al-Kaff et al. (2019). [2] proposed autonomous UAVs for the critical applications of forest fire surveillance. Algorithms are implemented into the device to perform surveillance tasks within a specific area, autonomous take-off/landing, trajectory planning, and fire monitoring. This design is equipped with thermal cameras, temperature sensors, and communication modules to provide information about the fire and report to the Emergency Response Team (ERT).

Manuj et al. (2019). [3] proposed using semi-autonomous drones for firefighting operations rather than putting the firefighter's life at risk. The paper provides information about improvements on the existing hexacopter to obtain a stable flight, gather and store Global Positioning System (GPS) data and perform auto- landing.

BLOCK DIAGRAM AND DESCRIPTION

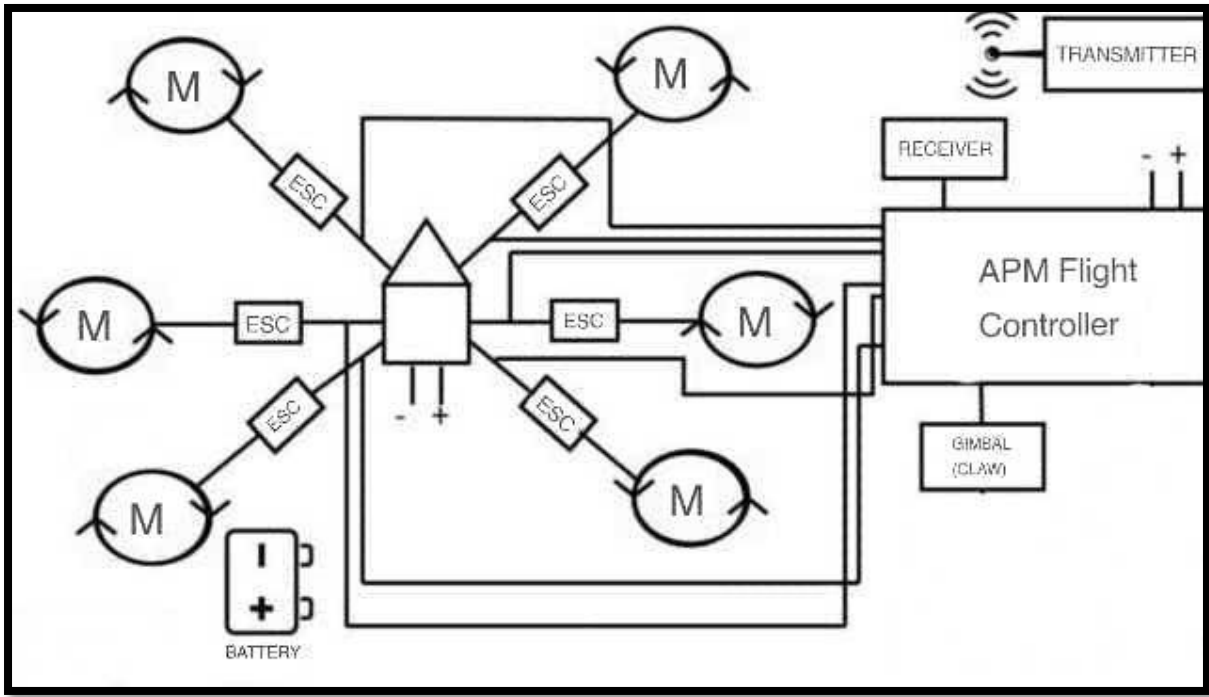


FIGURE 1: BLOCK DIAGRAM FOR FIRE EXTINGUISHING DRONE

The components used are as follows:

- An S550 Hexacopter frame with landing gears,
- M stands for a brushless motor with 1400KV,
- ESC(Electronic Speed Control) used here is Simonk 30A,
- A lithium Polymer (LIPO) battery of 5200mAh,
- APM(ArduPilot Mega) flight controller,
- A flysky RC controller is used, and lastly
- A gimbal, i.e., a claw mechanism, is used

All these parts are essential for the working of a drone. The S550 hexacopter frame kit is a perfect lightweight solid Hexacopter frame with carbon fiber landing gear and a bonus built-in printed circuit board (PCB) for neat and easy wiring. It is Hexacopter Frame that employs six arms to get into the air. The S500 has an intense, light, and sensible configuration, including a PCB(Printed Circuit Board) with which you can directly solder your ESCs to the frame. So, it avoids using extra PDB(Power Distribution Board) and makes the mounting clean and neat. A brushless motor is then installed on the frame, and the motor's output pins are connected to the ESC's input pins. The output pins of the battery are soldered on the frame. The input pins of the ESC are then soldered onto the frame so that each ESC receives a power supply. We have another input pin on ESC connected to the flight controller's output terminal. As stated, we must connect all the respective ESCs with the motor and flight controllers. Now the input terminal of the flight controller is connected to the receiver. It has five pins that are connected to the flight controller. After this, the transmitter present on the RC controller is activated and sends the data to the receiver. A gimbal is also assigned an output terminal from the flight controller, and according to the transmitter's input, it opens and closes its claw.

ADVANTAGES & CHALLENGES

Some of the advantages of Fire Extinguishing Drone are as follows:

Situational awareness: In a typical scenario where a fire has broken out in a building, firefighters arrive at the spot and begin their operation with limited information about the extent of the fire and damage it has caused to the structure.

Reach difficult places: Drones are efficient in going to tight spaces since they are agile and compact machines and deploying them firstly eliminates the risk of human life injury.

Search and rescue: Firefighters are actively involved in search and rescue missions. A drone can do the job of 100 people by scanning a large area and identifying people in distress. During a natural calamity like an earthquake, drones can fly over fallen structures, identify trapped individuals, and even identify dangerous leakages.

Some of the challengers of Fire Extinguishing Drone are as follows:

- **drone cannot stitch data collected from multiple drones** together for better situational awareness. Sharing live data becomes difficult, more so when multiple drones are involved.
- The **flight time** for the drone is very less therefore it needs to be dispatched from nearest fire station.

APPLICATIONS

- The drone allows for easy fire extinguishing without risking life. Also, it can access forest areas instantly, which would require hours for fire trucks or humans to arrive.
- It can easily attain high altitudes, which helps reach multistorey building windows.
- A drone is sent to fire locations as scouts, using camera imaging technology to help first responders in their rescue efforts. It can be equipped with thermal cameras to detect irregularities on various infrastructures in low light-dark conditions.
- For instance, Authorities could use drones for other applications. An ambulance drone carrying a defibrillator is used to assist sudden cardiac arrests with instructions on different first aid procedures.

CONCLUSIONS

This paper describes the importance of the Drone in Firefighting operations. The Drone will be designed to carry a maximum of 3-4 Kg payload with 15-20 minutes battery endurance, reducing the risk to the personnel involved in firefighting operations. Drones can be equipped with a thermal imaging camera, which is used to detect individuals trapped in buildings during fire accidents. The drones need to become intelligent and quick-witted to optimize industrial processes, maximize their utility, and be widely established in future fields. If more emphasis is laid upon these criteria, they can pertain to Engineering, maintenance, critical infrastructure management, and asset management operations. There are many drone Start-Up in India. Some of these are Paras Aerospace, Throttle Aerospace, General Aeronautics, Redwing Labs, etc. Companies in India are trying to impose these innovative technologies into their systems to make their processes safer, more reliable, and more predictable. From the industrial perspective, implementing this technology can be ideal in the automotive industry.

FUTURE SCOPE

Thermal assessment: In a firefighting situation, firefighters work against the clock to save the lives and integrity of the structure. That is why it is essential to direct their efforts toward the source of a fire.

Drones equipped with thermal cameras can assist firefighters in identifying hotspots inside a blazing structure. Accordingly, firefighters can direct their efforts to bring the situation under control.

For larger fires, it should be possible that multiple drones would need to operate together under the same set of instructions, share data, respond collectively, and avoid obstacles and other dangers.

Night Vision: Seeing in the dark alongside a drone with a night vision camera is a massive advantage, primarily when people must conduct these operations.

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PROJECT PROGRESS REPORT

Start date	Activity performed	Outcome	Next meet	Remarks
25/09/2022	Collection information about spare parts	Information gathered	30/09/2022	
30/09/2022	Item price collection	Price noted	12/10/2022	
12/10/2022	Hardware assembly	Hardware assembled partially	23/10/2022	
23/10/2022	Report started	Report completed	-	