International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056
Volume: 07 Issue: 04 | Apr 2020 www.irjet.net p-ISSN: 2395-0072

FIRE FIGHTING DRONE USING EXTINGUISHER BOMB

Rupali Patil[1], Tejas Patil[2], Nitesh Sawant[3], Hrishikesh Thakur[4], Dhiraj Surve[5]

[1]*Prof Rupali S Patil, Dept of EXTC Engineering, BVCOE College, Maharashtra, India*
[2]*Tejas P Patil, Dept of EXTC Engineering, BVCOE College, Maharashtra, India*
[3]*Nitesh M Sawant, Dept of EXTC Engineering, BVCOE College, Maharashtra, India*
[4] *Hrishikesh N Thakur, Dept. of EXTC Engineering, BVCOE College, Maharashtra, India*
[5] *Dhiraj R Surve, Dept. of EXTC Engineering, BVCOE College, Maharashtra, India*

Abstract - *The flying vehicles which operate from the remote control area are stated as Unmanned Aerial vehicle(UAV). In the way of future the Drones have major roles. They can take the risk which the human had to take to do the critical work. The Fire fighters have to do same critical work and they have to risk their lives. So, to lower down the risk we design a Fire Fighter Drone. It is a Hexacopter Drone, that design to carry the fire extinguisher ball which is a compose of powdered CO2. The fire extinguisher balls are hold by gimbal, which has a lock that operate from ground station. The Hexacopter drone are design for heavy lifting. There is used of six 680kv motors, where three of them are clockwise and three of them counter clockwise for stability.*

Key Words: drone, Firefighters, thrust, extinguisher bomb, fire, technology.

1. INTRODUCTION

To protect and save lives and properties, extinguish fires are the main goals of fire fighters. Until Recently trucks, ladders, and hoses such a low or insufficient technologies are in use at many of places. But now fire- fighting drones are replacing this low tech machines. As compared to the old methods drones are more help full to overcome fire. Due to increased urbanization, traffic, taller buildings, and new dangerous substances being used in construction, firefighters are looking at drone technologies to help them in achieving their goals [1]. New Technologies such as electronic and gas sensors, heat-resistant materials, improved cameras, autonomous and swarm operations, and improved range are being added to commercial drones. Fighting a raging fire is one of the big challenge for Fire fighters. They try to put off the fire with very little information, but have no idea of the size and scope of the fire. But fire-fighting drones help to overcome this problem by providing better information about range of fire, total trapped peoples and many more. Fire department also taking advantage of this new technology drones. Hence in many countries now a days fire-fighting drones are commonly getting used in fire departments. [3] And the government also motivating youngsters to make drone with new features and new technology.

In this paper, we propose an approach for fire detection and localization with a thermal sensors, GPS tracking system and moving thermal infrared camera mounted on an Unmanned Aerial Vehicle (UAV). Also extinguishing of fire using drone and fire extinguishing ball. In contrast to many other papers [2]

1.1 EASE OF USE

A) Used for Fire Department

B) Use for Emergency

C) To Control the fires which are caught in woodland regions.

D) For chemical, explosive hazard, or structural issues, the drone ought to enter a building, or warehouse to assist in assessment and evacuation reducing the risk to firefighters by means of supplying eyes and ears in the affected quarter.

E) To stumble on human beings caught in buildings, woodland areas which are not visible due to smoke.

1.2 FEATURES

-Light in weight

-Two servos: Single/double release

-Fast reload design

-Portable

-Compact

-Durable

2. DESIGN OF THE FIRE FIGHTING DRONE

2.1 HEXACOPTER CONFIGURATION

Hexa- copter uses six motors so that it will rotate six propellers. This hexacopter lifting movement makes use of the thrust this is generated with the aid of the propeller aggregate of hexacopter body. The frame configuration is normally identified as two type: the Plus (+) and X configurations as in Fig. The Hexacopter has 6 ranges of freedom (DOF), in which the six degrees of freedom are affected by the rotational pace of every rotor, for this reason both frames will have exclusive motion dynamics fashions. In this studies, the Plus (+) configuration frame is used [1].

Fig. indicates that each arm is connected to a brushless DC motor and has a propeller (constant-pitch) so the rotor can pressure the air float downward to generate the lift pressure. The route of rotor rotation has two directions, i.e. 3 counterclockwise rotors (Counter Clock Wise; CCW) and 3 other clockwise rotors (Clock Wise; CW). So, it's miles certainly visible that the dynamic movement of hexacopter is genuinely motivated most effective by the rate of motor rotation. [1]

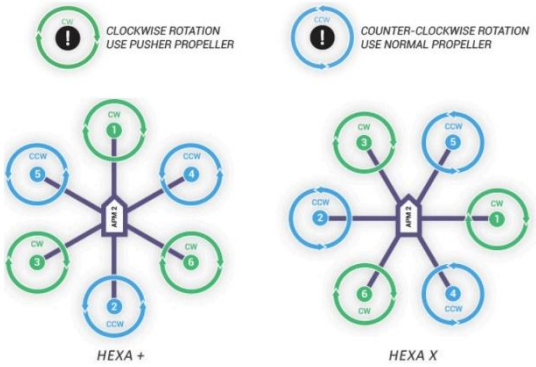

FIG 1: Frame configuration [1]

2.2 FRAME DESIGN

The frame must be construct from such material which is light in weight and capable to work or withstand in hazard environment. For such conditions we select an aluminium material. The aluminium is strong, Light weighted and flexible. The hexacopter has six arms Each arm is 2ft long. So, the six arms are attached to the center of doubled Hexagonal plate. For center we use an acrylic sheet. This acrylic sheet is cut in hexagonal shape. So, out of 2ft long arm 3 inches of each arm are inserted into the double hexagonal plate. [4]

Fig 2: Equivalent Frame

2.3 THRUST AND MOTOR

2.3.1 THRUST CALCULATIONS

In the designing of hexacopter the populsion element is an motor. The motor is most important component in hexacopter. The fire-fighting drone have to lift 1.5kg fire-fighting ball. [] So, while selecting the motor we have to determine the total thrust that motor can produce. The thrust must be double the amount of weight that the hexaopter have to lift. To select such heavy lifting motor we have to determine the amount of thrust it can produce by using following thrust equation. [12]

$$Thrust = \frac{Weight \times 2}{Number\_of\_Motors}$$

static thrust can be calculated by the following equation

$$T\text{^}3 = \frac{\pi}{2} D\text{^}2 \rho P\text{^}2$$

EMAX MT3515- The emax mt3515 is a brushless motor. The brushless motor uses a direct current(DC) electric motors. Which are operate without mechanical brushes. This motors are more efficient for long run and have more advantage than other ordinary motors. [11]

2.3.2 MOTOR-EMAX MT3515 650KV (CW THREAD/CCW ROTATION)

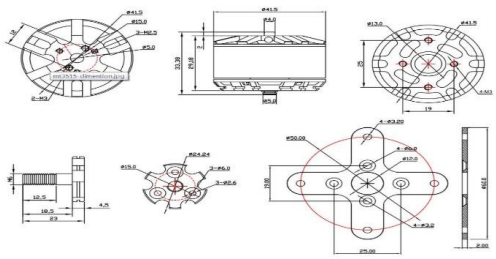

FIG 3: MOTOR SPECIFICATION [11]

SPECIFICATION:

- Motor KV- 650KV
- Max Thrust – 2870gm
- Shaft: 5mm
- Length: 33.38mm
- LiPO Batteries: 4S-6

2.3 PIXHAWK

Pixhawk PX4 2.4.8 Flight Controller is a high-performance autopilot-on-module suitable for fixed wing, multi rotors, helicopters, cars, boats and any other robotic platform that can move. [9] It is targeted towards high-end research, amateur and industry need and combines the functionality of the PX4FMU + PX4IO [10]

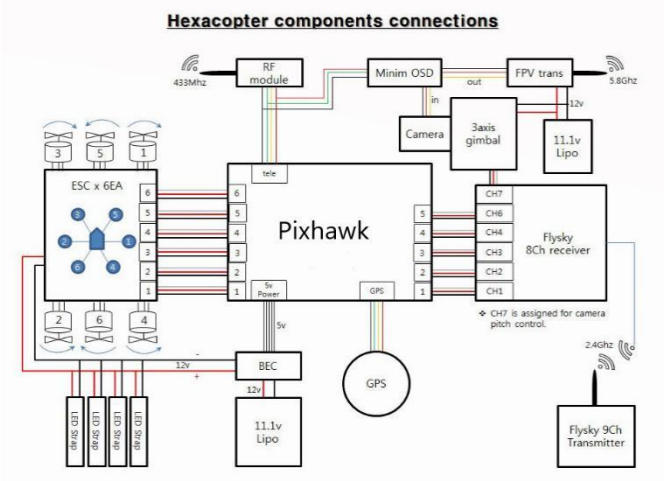

Fig 4: FFD Component Connection [10]

2.4 FIRE EXTINGUISHER BALL

For unmanned aircraft system(UAS) we have to use such system which can carry for long distance and capable to extinguish the Fire. For such work we have decided to use the Fire Extinguisher ball [5]. The Fire Extinguisher ball is compress of dry ammonium phosphate mono which is dry chemical fire extinguisher. When the ball comes in contact with fire for nearly 2second it works as a firecracker and the ball blast with spreading of chemical powder. [6]

Fig 5: Fire Extinguisher ball [5]

2.5 FIRE BALL HOLDER DESIGN

The design of fire ball holder consists a railing system which is attach to the bottom plate of acrylic sheet. This system having an cage type. [6] In this system the arduino is used to command the system to release and block the ball. The barrier is used to release and stop the fire extinguishing ball. The rails serve the guide to the fire- extinguishing ball. A servo motor controls the angle at which the railing system is going to rotate. When the UAV reaches its desired location the servo motor activate and lowers the railing and at same time it push the fire extinguishing ball from back of the cage. [5]

Fig 6: Fire Ball Holder [8]

3. CONCLUSION

This new concept of Fire Fighting Drone provided to reduce the time to clear a building or find a distressed inhabitant. This is also useful to help the Firefighters as well as to save their lives. The components that are being used to make this drone is also cost effective. The Fire Fighting Drone are design for heavy lifting.

REFERENCES

[1] "FIRE FIGHTING DRONE", Abinesh.D.V , Deepak.A.K, Chandraprakash.K, Gowtham.M, Ananthi. K Sri Krishna College of Engineering and Technology, International Journal of Innovative and Emerging Research in Engineering Volume 4, Special Issue 1, NCIAR2k17

[2] "Low Resolution Person Detection with a Moving Thermal Infrared Camera", by HotSpot Classification Michael Teutsch1, Thomas M¨uller1, Marco Huber2, and J¨urgen Beyerer1 1Fraunhofer IOSB, Karlsruhe, Germany 2AGT International, Darmstadt, Germany {michael.teutsch, thomas.mueller, juergen.beyerer}@iosb.fraunhofer.de marco.huber@ieee.org, 2017

[3] "Fire Detection and Human Behaviour", B. B. PIGOTT Fire Research Station Borehamwood Herts WD6 2BL, UK.

[4] https://www.dronefly.com/fire-fighting-drones-drones-in-feild-of-infographic

[5] "Automatic CO2 Extinguisher Fire Fighting Drone", by Ethara Bala Vyshnavi, Amareswari Ambati, Gorantla Chamundeswari, Garre Vineetha , Dr.Sk.Khamuruddeen, Faculty Dept.of ECE, in (IJERECE) Vol 4, Issue 12, December 2017

[6] "Use of Fire-Extinguishing Balls for a Conceptual System of Drone-Assisted Wildfire Fighting", Burchan Aydin, Emre Selvi, Jian Tao and Michael J. Starek, Published: 12 February 2019.

[7] An article on " fire fighting drone using CO2 ball extinguisher" by Yuvraj Akhade, Akash Kasar, Anuja Honrao, nehal Girme in IJIRCCE vol. 5, issue 2, February 2017
[8] http://dronenodes.com/firefighter-drones/
[9] https://www.roboticsbuisnessreview.com/unmanned/firefighting-drones-aim-to-fly-higher-save-lives/
[10] (http://www.arducopter.co.uk/uploads/6/7/0/2/6702064/1322957_orig.jpg)
[11] (https://robu.in/wp-content/uploads/2017/04/EMAX-MT3515-650KV-BLDC-Motor-CCW-Original-ROBU.IN_.jpg
[12] https://www.foxtechfpv.com/