

Design And Fabrication Of Firefighting Drone For 5 Kg Payload

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Abstract— The first response teams, such as firefighters, are exposing their lives to great risks in order to extinguish a fire. Currently, there is a lack of Unmanned Aerial Vehicles that are being used with the purpose of extinguishing fire. The Unmanned Aerial Vehicle (UAV) is an aircraft without a human pilot on board. Its flight can be controlled autonomously by computers in the vehicle, or by remote control under the direct command of a human. Fires that occur in homes and non-residential buildings as well as fires in wild lands cause plenty of health issues; including death to humans and animals, in addition to great economic losses in structures, equipment and vegetation. By UAV Monitoring, Inspection and stopping the fire by quadcopter drone.

Keywords—Drones, Firefighting, Payload, fabrication

I. INTRODUCTION

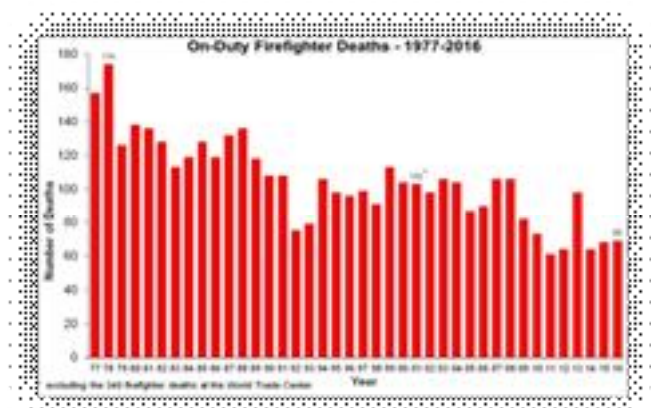
Here is where our team plays a great role by generating new ways of preventing from fires. In order to help those that risk their life when a fire takes place, the living beings that can be potentially harmed and their surroundings, such as edifications and forests, to preserve the goods inside a building once a fire occurs, and to help avoid fires in open spaces, this team decided to focus this design project in the development of an UAV that is going to prevent fires and also assist in extinguishing them. The quadcopter is built for firefighting situations for the areas where it is difficult for firemen to reach. It can be operated using a transmitter at a specific range or can also be turned on into autonomous for working in out of remote range which will return back on its own once the task is completed. It will be helpful for getting live feeds of the fire affected areas with the help of normal or heat sensing cameras. 1 Km remote testing was successfully completed for 5 kg pay load. Presently 25 kg payload octocopter design is in progress. With few engineering our DRONES can be used in agriculture, cleaning of high-rise buildings, forest surveillance, human organs, blood and medicine transportation, movie makings, onsite project monitoring, inspection and monitoring etc.

II. PAIN POINTS OF THE STUDIES

In 2017, 60 firefighters died while on-duty in the U.S. as a result of injuries that occurred at specific events that year. This is the lowest total reported since NFPA began reporting on this set of firefighter fatalities more than 40 years ago, and it is the sixth time in the past seven years that the total has been below 70 deaths. In the late 1970s and early 1980s, by comparison, the number of such deaths averaged close to 150 per year.

Of these 60 firefighters, 32 were volunteer firefighters, 21 were career firefighters, three were employees of federal land management agencies, two were contractors with state and federal land management agencies, and two were prison inmates.

There was only one multiple-fatality incident in 2017, when a drunk driver struck and killed two firefighters and injured a third at the scene of downed power lines.



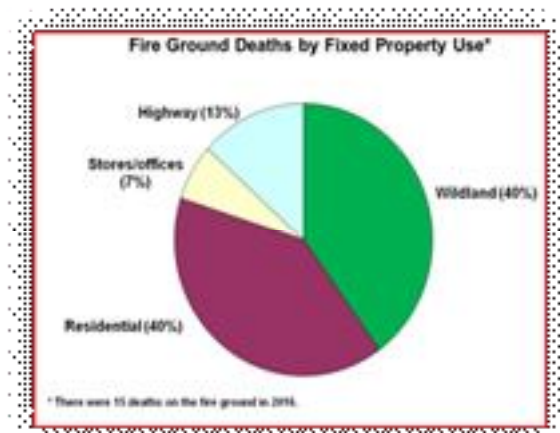
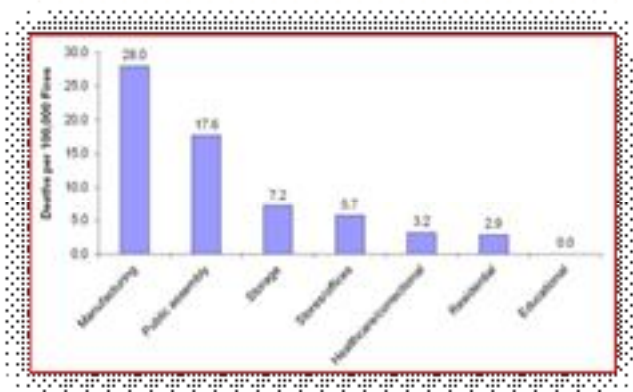


Fig. 1. Firefighter lost their life during various fire accidents

III. UNIQUENESS OF OUR PoC

- Customized drone design and dropping mechanism
- Easy swap-able of battery
- Similarly we can swap different setup for other application like organ transportation, surveillance, fertilizers etc. (Drone design is common but we have the modified application module).
- Upto 1km range we can control
- Battery and Flight Time is high
- Rectangular Landing Skids
- Customized mission planning system.
- If any physical damages happened heat-sensing we can change any parts immediately

IV. FIRE EXTINGUISHER BALL SPECIFICATION

When throw into or rolling to fire, it will explode and make huge noise to catch everyone's attention nearby.

- Ignition: Automatically explode within 3-5 seconds after touch of fire
- Content: Environmental harmless dry powder
- Validity: 5 Years
- Automatic reaction time: 3-5 Seconds
- Effective extinguish area: 1.3kg - 3cubic meter. 0.5kg-1.6 cubic meter

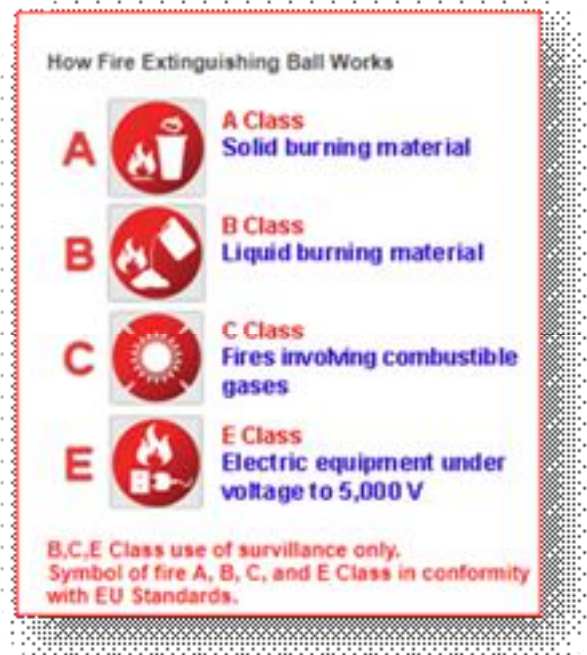


Fig. 2. Fire extinguisher ball specification

TABLE I. DRONE SPECIFICATION

DESCRIPTION	SPECIFICATION
TYPE	OCTA-COPTER
MOTOR	700&1100KV
ESC	80 AMPS
TRANSMITTER	TURNIGY 9XR
RECEIVER	6 CHANNEL
FLIGHT CONTROLLER	NAZA-M-LITE
PROPELLER	11*4.5CM
BATTERY	10000 Mah
RANGE	1 km
PAYLOAD	5 kg



Fig. 3 Completed model



Fig.4 CAD model of the 25kg payload model-isometric view

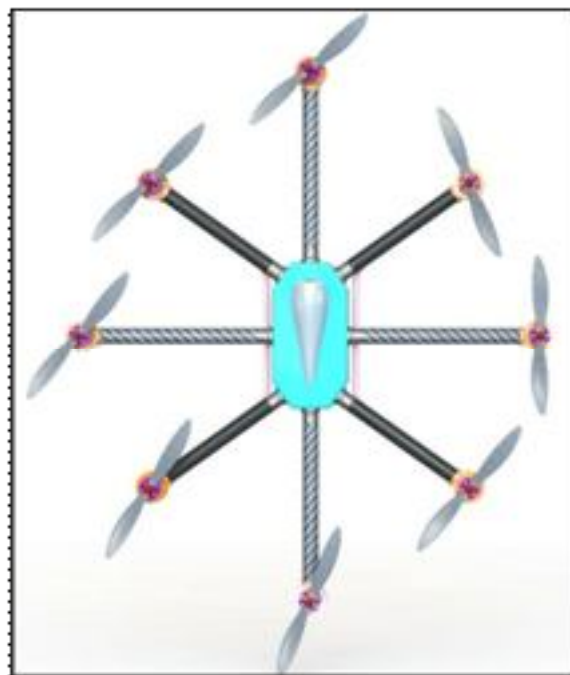


Fig.5 CAD model of the 25kg payload model top view

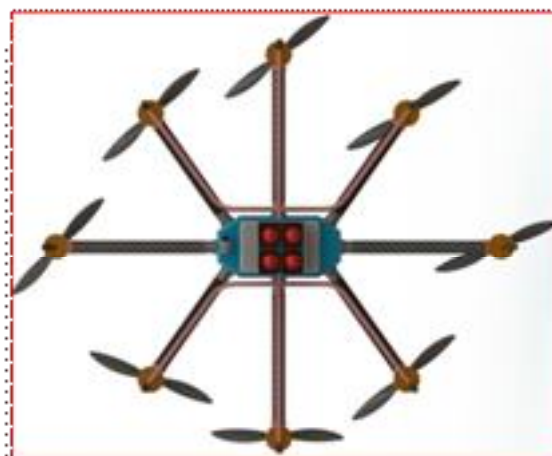


Fig.6 CAD model of the 25kg payload model bottom view



Fig.7 CAD model of the 25kg payload model



Fig.8 CAD model of the 25kg payload model fire ball dropping mechanism

V. BLOCK DIAGRAM

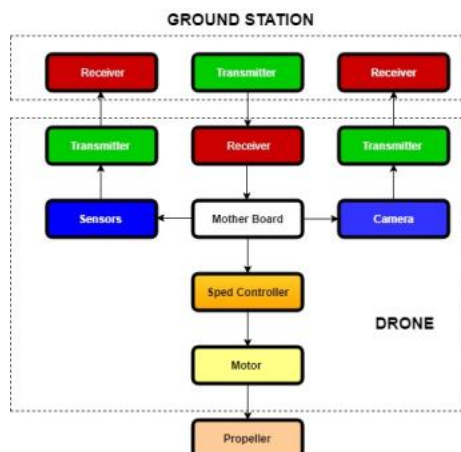


Fig.9 Block diagram of the drone operation

VI. PROCESS LAYOUT

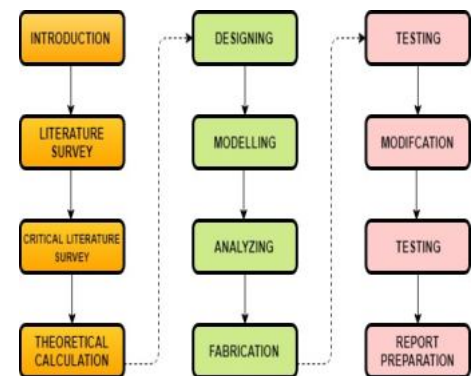


Fig. 10 Process Layout

VII. OTHER APPLICATION

- Drones are finding their uses quite abundantly, in various sectors of customer:
- **Precision Agriculture:** Used in the Golden Prairie to capture the soil and growth information on thousands of acres of organic millet crops in Colorado, USA.
- **Infrastructure Inspection:** Used in San Diego to inspect electric and gas lines.
- **Mining:** Barrick Gold, Imerys and Rio Tinto use drones for pit surveys, stockpile management and road analysis.
- **Disaster Response:** Drones helped in assessing the damage and relief efforts in Nepal after the recent earthquake.
- **Film Making:** Drones equipped with cameras, and with special stabilizers and gimbals incorporated, are used for advanced photography and filming.
- **Real Estate** – showcase homes, marquee properties, commercial buildings, and structures
- **Legal** – support forensic investigations, insurance claims, and property assessments
- **Construction** – progress reporting for commercial, residential, and civil engineering
- **Land** – landscape architecture, land development, and research.

VIII. CONCLUSION

Overall, the basis of this project was to apply engineering principles and design concepts of firefighting drones to save the fireman lives. Through the design of a UAV, arm and payload, the transportation of fire extinguisher components

is feasible. 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 fire extinguishers balls. Thus, the design and testing of the semi-automatic UAV successfully demonstrated the concept feasibility of implementing in fire department.

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