

DEVELOPMENT AND APPLICATION OF ROTORCRAFT -UNMANNED AERIAL VEHICLE

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Abstract – In this paper we have design the UAV for spraying of pesticides over the crop. Conventional (manual) method to spray the pesticides required more time and its cause diseases. The Unmanned aerial vehicle (UAV) – aircrafts are used to spray the pesticides to avoid the health problems of humans when they spray manually. UAVs can be used easily, where the equipment and labors difficulty to operate.

The shortage of labour has been increasing day by day.

Key Words: Spraying of Pesticides, UAV, Health Problems, Shortage of labour

1. INTRODUCTION

As much as India depends upon the agriculture, still it is far short from adapting latest technologies in it to get good farm. Developed countries have already started use of UAV's in their precision agriculture and remote sensing.

It is very fast and it could reduce the work load of a farmer. In general, UAVs are equipped with sprayers for pesticide spraying. The integration of UAV with sprayer system results a potential to provide a platform to pest management and vector control. Plant protection drone's spraying system mainly includes tank, pumps, tubes and nozzles. Pumps transport liquid from the tank through tubes into nozzles, and nozzles spray the liquid evenly onto crops.

1.1 NEED

Lots of load is to be lifted by farmers during spraying of pesticides. To reduce the human effort is type of system is introduced. There is a lot of reduction rate in labour or human in agriculture in India today as per environmental conditions. Agricultural farmers work with both labour/human with many different types of farm machinery that are used to help with soil preparation, crop planting, harvesting and crop processing.

1.2 OBJECTIVE

I] Design rotorcraft and sprinkling system with less weight.

- II] To Gain Stability of system.
- III] To make applications based system.
- IV] To Reduce Cost.

2. METHODOLOGY

2.1 SELECTION OF COMPONENTS

2.1.1 Propulsion System:

1. Battery operated rotorcraft

2.1.2 Selection of Control System Components

1. Flight Controller
2. Electronic speed Controller
3. Transmitter and Receiver

2.1.3 Selection and testing of Materials

1. Frame- Aluminum, ABS Material
2. Propeller- carbon Fiber
3. Battery-Lipo, 11.1 V, 8000mAh, 30C, 3 cell,
4. Motor- Electric Brushless DC motor (BDLC),
Thrust- 1250 Gms,
RPM/V-1180.

2.1.4 Selection of component for Rotorcraft

2.1.4.1 Weight

As Total Weight of the Rotor Craft is up to 5290 grams, referring the above table, required thrust is calculated by considering the weight.

2.1.4.2 Thrust calculation:

$$\begin{aligned} \text{Equivalent thrust required} &= (\text{Total Weight} \times 1.2) \\ [\text{Thrust should be 20\% greater than the total weight}] &= (5210 \times 1.2) \\ &= 6348 \text{ grams} \end{aligned}$$

2.1.4.3 Motor and Propeller selection:

Motor selection:

BLDC (Brush Less Direct Current) motors are used in prototypes of multi rotors.

As we need $(6348 \div 4) = 1058$ grams of thrust per motor.

So we selected **1180kV** BLDC motor.

Specifications:

Max. Thrust per motor (grams): **1250**

KV (rpm/v): **1180**

Max. Power (W): **495**

Propeller:

Propellers convert Motor Torque force into Thrust Force.

Propeller selection:

As per the motors specification, propeller **1050** is recommended.

Specifications:

Designation of 1050

Diameter of propeller (in inches) = 254 millimeter.

5= Pitch of propeller (in inches) =142.875 millimeter.

2.1.4.4. Payload:

The total load that is to be lifted for application purposes during the flight for long time is called as pay load.

Assuming payload to be **2000** grams.

2.1.4.5. Material Selection:

Selection of material is a key aspect while designing the model. Because of the requirements that are needed to keep the structure light in weight as possible. Lighter the weight of the structure more is the payload and flight time. Also the material should remain stiff as well.

For fulfilling these requirements, following properties of materials are to be focused.

- High Stiffness
- Low Density
- Higher Strength

3. WORKING

A button is used to ON/ OFF the sprinkling system located on remote. The button operates diaphragm pump used to increase the discharge pressure given to the nozzle. Using two nozzle at location of facing towards crop. The pesticides sprayed on it. The tank is used to store the pesticide in liquid form.

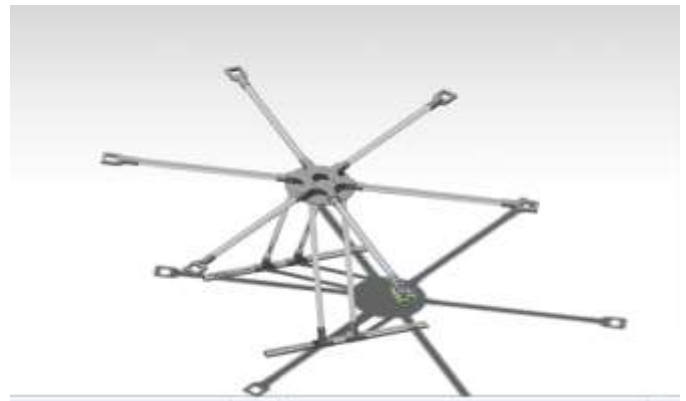


Fig -1: CAD MODEL



ACTUAL MODEL

4. CONCLUSION

Design of Rotorcraft is mainly depends on material used aluminum, ABS. Different materials are used by considering its application. Sprinkling system is used to spraying pesticides on crops. Nozzle with regulator are used to adjust the flow through nozzles.

ACKNOWLEDGEMENT

We have received help and guidance from a number of people during the development and completion of this paper. I wish to express my appreciation and gratefulness to our head of the department Prof. G. E. Kondhalkar and a great pleasure goes to my guide Prof. Dr K.H.Munde and Prof. C.E. Kolambe for their valuable guidance thoughtful suggestions, cooperative attitude and the constant moral support in completing our paper.

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