DESIGN, CONSTRUCTION OF A SPINNING DRONE WITH REDUCED WEIGHT AND POWER CONSUMPTION

Project Reference No.: **47S_BE_0243**

College *: SJC Institute of Technology*
Branch *: Department of Aeronautical Engineering*
Guide(S) *: Dr. Nagesh D*
Dr. Deepa M S
Student(S) *: Mr. Abdul Saad Khan*
Mr. Chandramohan.V
Ms. Ranjitha.V
Ms. Thanshree A N

Keywords:

UAV, Tri copter, Frame, Flight controller, Servo control, 3D printing

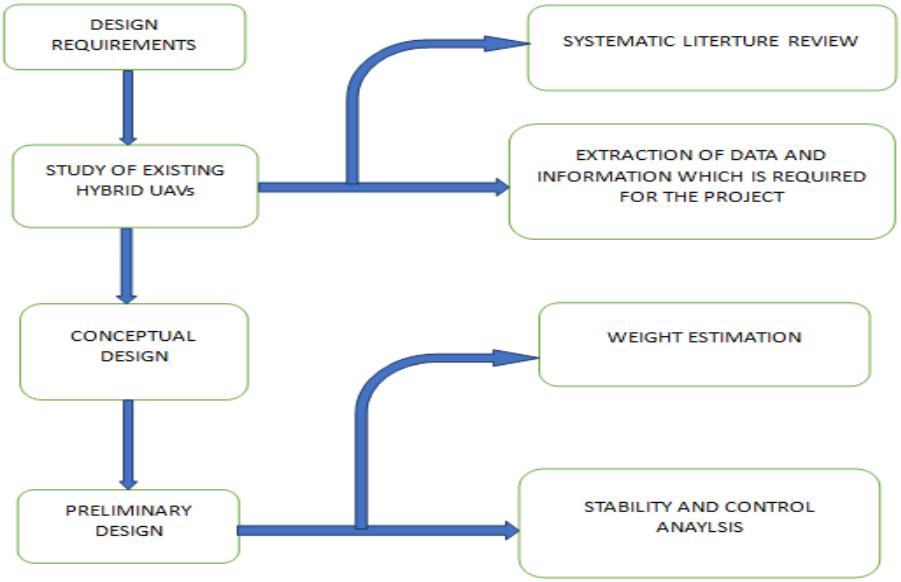
Introduction:

UAV (Unmanned Aerial Vehicle): An unmanned aerial vehicle (UAV) is an aircraft that carries no human pilot or passengers. UAVs-sometimes called drones can be fully or partially autonomous but are more often controlled remotely by a human pilot. TRICOPTER: One type of multi-copter that has three motors and three propellers is called a tri-copter. The tri-copter UAV is one which has three rotors. Notes that tri-copters are more flexible, less- expensive and offer greater manoeuvrability compared to quad copters. They may also yield longer flight times due to one less rotor and hence larger disc areas compared to quadcopter. The tri-copter vehicle has advantages in terms of total mass, volume and energy consumption, which is more efficient It is unique because the arms can also rotate along their axes (servo-driven mechanism) in the central hub. The arms have air foils. When the rotors tilt at an angle the drone starts spinning and acting as a massive rotor that provides additional lift. Choosing a tri-copter over a quadcopter may be simply due to tilting of the arm.

II.DESIGN PRINCIPLE: Tri copter design basically, consists of three arms that are front two arms and tail rear arm. We take first one arm length and we have also taken 16cm length and draw a circle. Then from one arm make another arm at 120- degree angle then draw a circle and rear arm and end tail. We must draw a line at which the two circles are intersecting and we got the dimension of 3 arms with C.G point at the center of circle. The size of tri copter (UAV) depends onto the surroundings and the impact act on the tricopter. To understand the dynamic variables and effect on tricopter the 6 degree of freedom nonlinear equations are implemented for design of the tricopter.

This tricopter can also be called Transformable Hovering Rotorcraft (THOR) and two of its flight modes, Hovering mode (H-mode) and cruising mode (C-mode), with the

objective of developing a structurally efficient hybrid unmanned aerial vehicle. There are two types of tri-rotor UAV models. when the aircraft in steady flight, both the THORs H-mode and C-mode needs to be in equilibrium with respect to its centre of mass. Conventionally, this is solved by strategically arranging the masses on the craft to balance out the aerodynamic forces and torques.



Objectives:

- To build a tri-copter in order to reduce the weight and power consumption.
- To select the appropriate components, including the frame, motors, propellers, battery and flight controller, to enable the copter to flyeffectively.
- To build the copter by maintaining full utilization of all aerodynamic surface andpropulsion source in flight modes.
- To fabricate the tricopter that allows the system to coexist and operate as both fixed wing and rotor wing.

Methodology:

- Problem identification and pre determine the gaps in objectives.
- Literature survey: Understand and implement the correct measures that were not done by other authors and researcher.
- Model the conceptual design which gives best aerodynamic performance and power consumption.
- Select the lightweight yet durable materials for the drone's frame and other structural components.
- 3D prints the modelled frame.
- Calculate the stability and control analysis.
- integrity and component.

Result and conclusion:

In conclusion, the spinning drone project has being a significant undertaking with promising results. Through the development and implementation of innovative technologies, the project has successfully created a drone capable of spinning while in flight. This unique ability opens up new possibilities for aerial manoeuvrability and expands the scope of drone applications.

The spinning drone project has demonstrated the feasibility of utilizing centrifugal force for enhanced manoeuvrings and stabilization. By spinning, the drone can achieve improved stability during windy conditions, making it more resilient to gusts and maintaining steady flight paths. Furthermore, the spinning motion enables the drone to execute agile maneuvers and perform complex aerial acrobatics, making it an exciting tool for various industries, including entertainment, cinematography, and search and rescue operations.

Overall, the spinning drone project represents a significant step forward in the field of unmanned aerial vehicles. Its unique spinning capability opens up new possibilities for drone applications, showcasing the potential for advanced manoeuvrability and stability in aerial operations. Continued research and innovation in this area will undoubtedly contribute to the evolution and advancement of drone technology.

Future Scope

The concept of spinning drones refers to UAVs that have spinning components or rotating structures, such as multiple rotors or rotating wings. Here are some potential areas of development and applications for spinning drones in the future:

- **Enhanced Stability and Manoeuvrability**: Spinning components, such as spinning wings or coaxial rotor designs, can provide improved stability and manoeuvrability to drones. These features allow for precise control, agile movements, and the ability to fly in challenging weather conditions or complex environments.
- **Payload Capacity**: Spinning drones with multiple rotors or larger rotating wings can potentially have increased payload capacity. This allows for the transportation of heavier equipment, supplies, or sensors, expanding the range of applications such as delivery, search and rescue, or scientific research.
- **Hybrid Propulsion Systems**: Future spinning drones may combine spinning components with other propulsion technologies, such as electric motors, gas turbines, or even hybrid systems. This hybridization can provide advantages like extended flight range, increased endurance, or improved energy efficiency.
- **Swarm Robotics**: The use of spinning drones in swarm robotics can unlock new possibilities. Cooperative behaviors and coordinated actions among multiple spinning drones can lead to applications such as autonomous exploration, distributed sensing, collaborative mapping, or synchronized aerial displays.
- **Entertainment and Shows**: Spinning drones can be utilized for entertainment purposes, including aerial light shows, synchronized aerial choreography, or interactive performances. The spinning components can create mesmerizing

visual effects and add a dynamic element to artistic displays.

- **Personal Recreation and Sports**: Spinning drones could also find their way into personal recreation and sports activities. Enthusiasts might enjoy flying spinning drones as a hobby, participating in spinning drone races, or engaging in freestyle flying competitions.
- **Novelty and Experimental Designs**: The unique spinning or rotating structures of these drones may inspire designers and engineers to create unconventional and experimental UAV designs. These innovative designs can push the boundaries of aerial robotics and contribute to advancements in aerodynamics, stability control, and structural engineering.