

## EXPERIMENT No.: 4

Name of the Experiment: Experimental study of propellers Blade Rotation CC & CCL & its role in control.

Objectives: To know about the propeller blade's role during the flight control in terms of CC and CCL rotations.

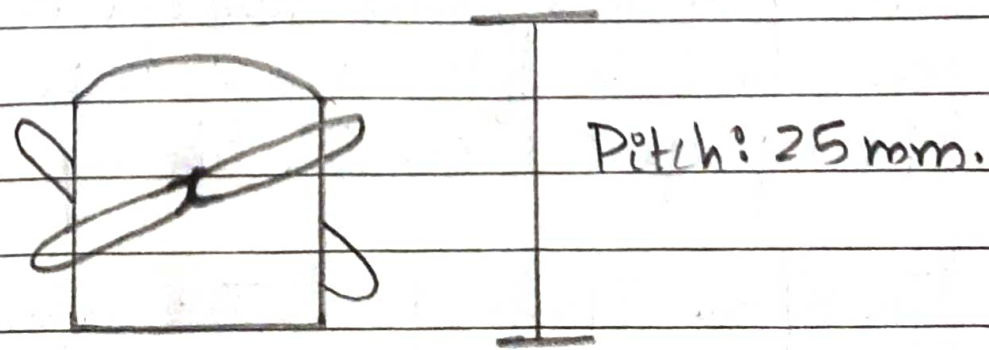
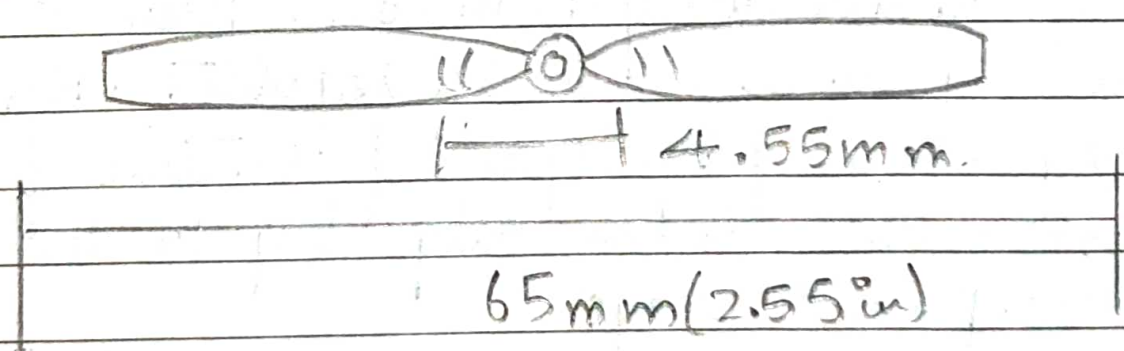
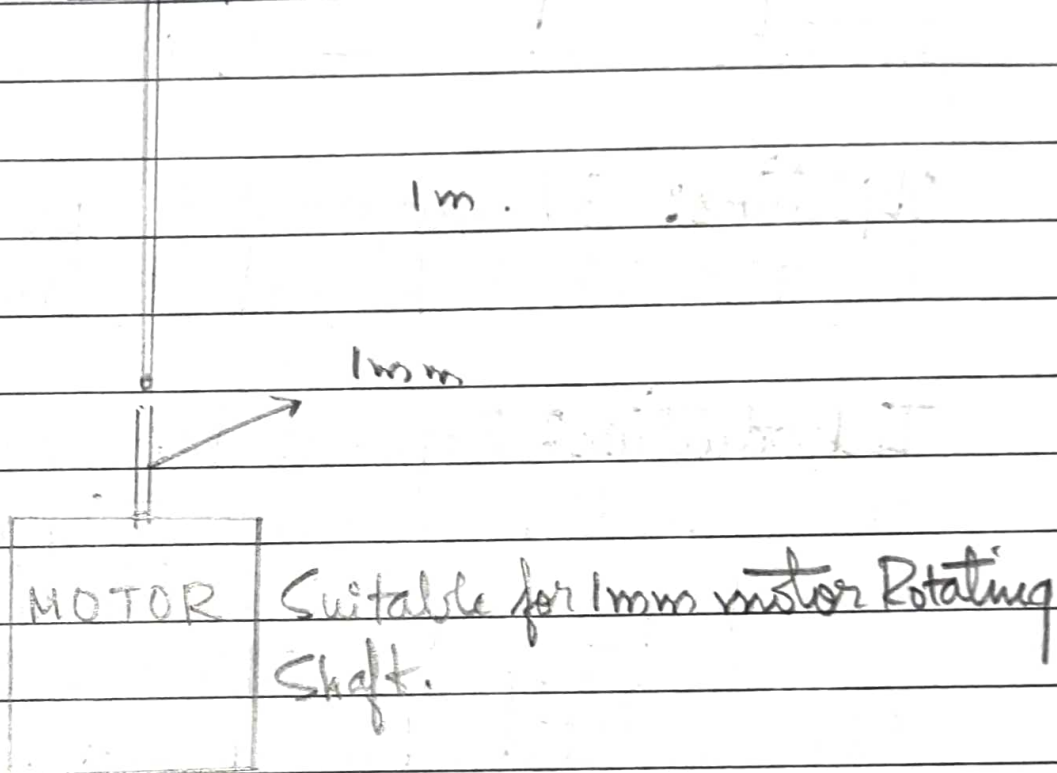
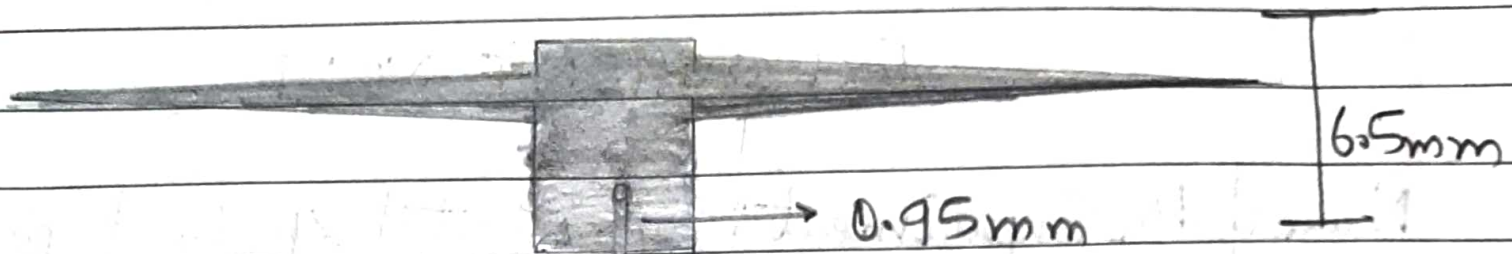
Introduction: Propellers for drones and UAVs. Propellers are devices that transform rotary motion into linear thrust. Drone propellers provide lift for the aircraft by spinning and creating an airflow which results in a pressure difference between the top and bottom surfaces of the propellers.

How do propellers work: In multicopter drones, propellers are connected individually to motors. These motors are then controlled by an ESC which regulates how fast each motor rotates by varying the speed of rotation of individual motors, the ESC is the only help to drone manoeuvre in several possible ways.

When propellers rotate they cut through the air and direct it downwards. If the drone is perfectly horizontal, this motion of the propellers creates lift by pushing against the wind.

The lifting force generated as well as energy it takes to cut through the air, depends on the shape and size of propeller/propeller. Atmospheric conditions also play a vital role.





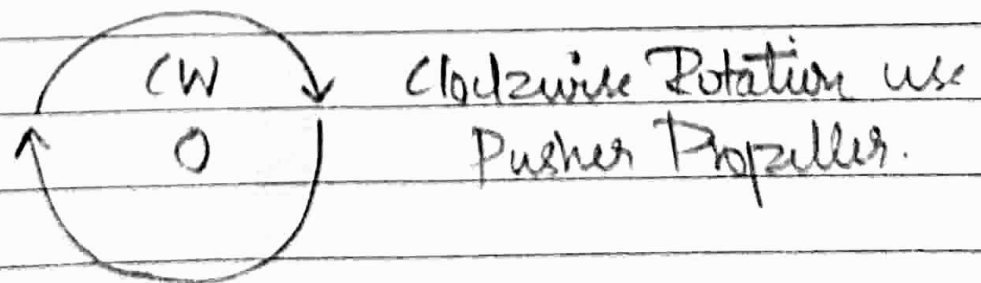
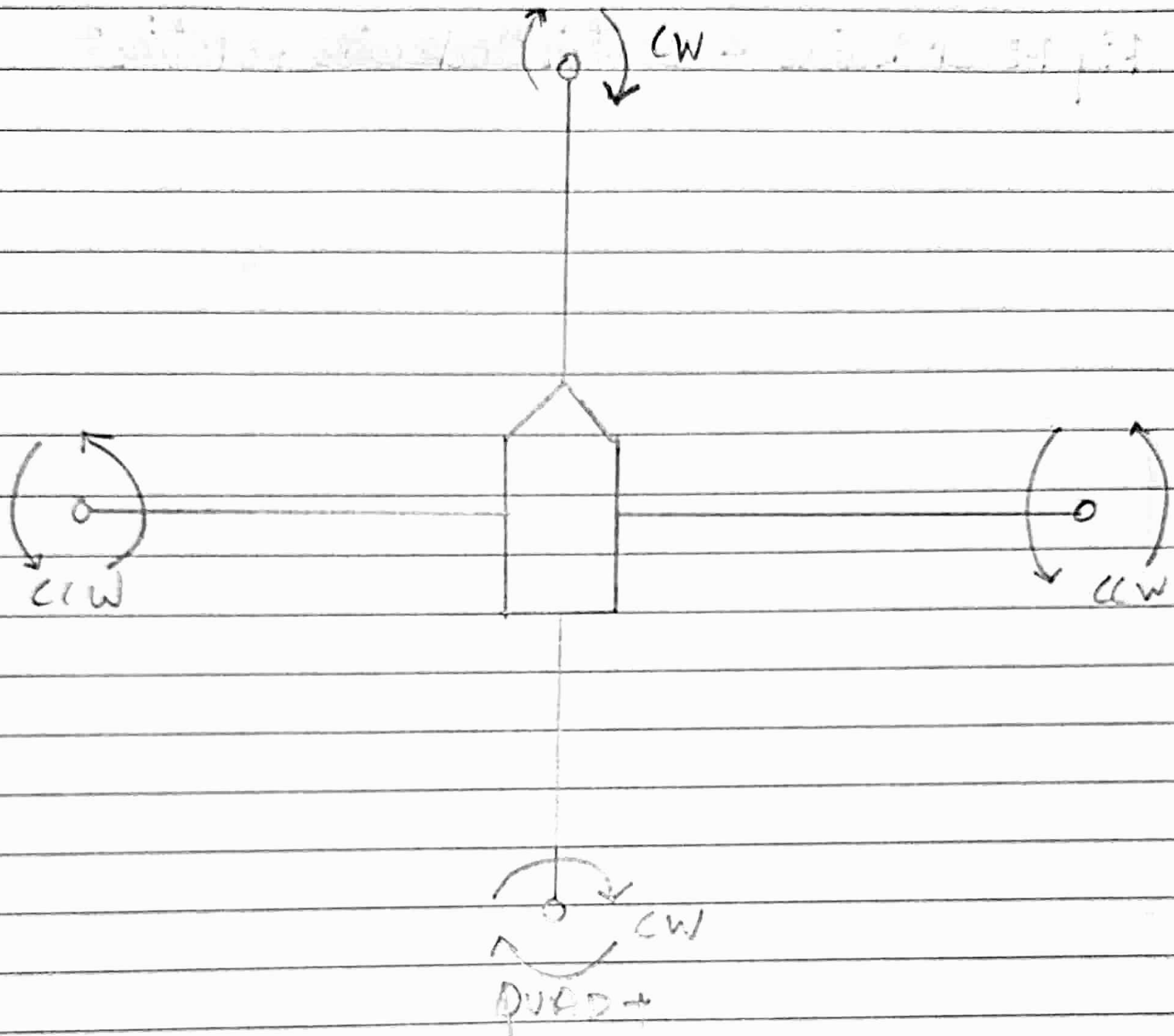
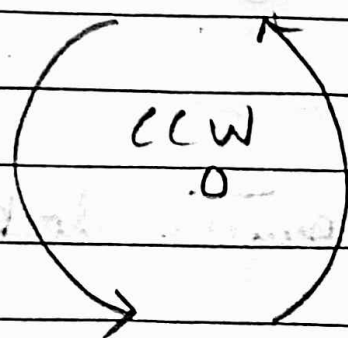
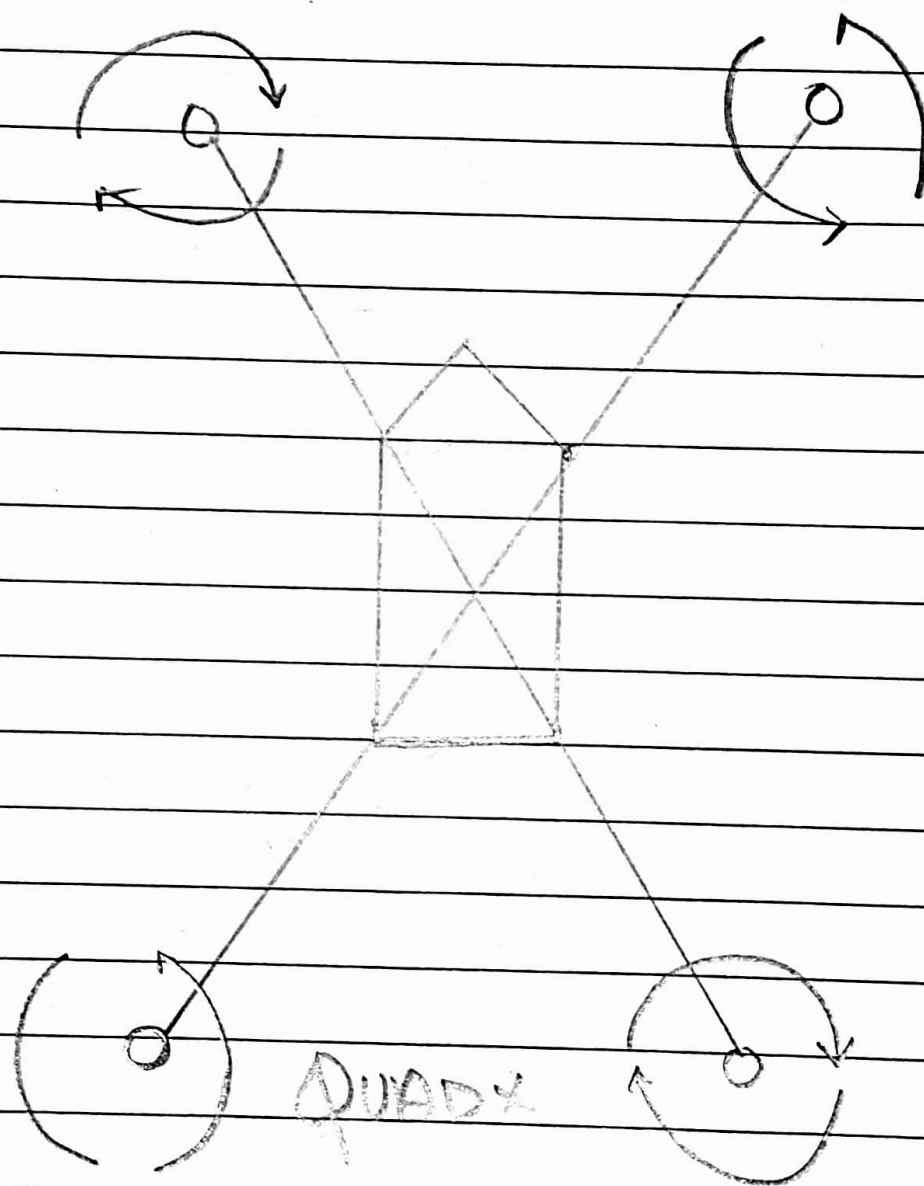


fig 4: Clockwise & counter clockwise rotation.

Fig 4: Clockwise & Counter clockwise rotation:



Counter-clockwise Rotation  
use normal Propeller.



## Drone Propeller Construction:

Drone propeller can be constructed with two, three or four blades. Propellers with more blades provide greater lift due to more surface area moving through the air per rotation, but are more inefficient due to increased drag. Similar drones with limited battery life are best suited to propellers with fewer blades.

Plastic propellers are cheaper and more flexible, allowing them to absorb impact better. The increased stiffness of carbon fibre propellers, although providing less durability, decreases vibration thus improving the flight performance of the drone and making it quieter. Carbon fibre is also lighter than plastic, allowing weight savings.

## Working Principle:

### a) Vertical lift - QMPO

Quadcopters use motor design and propeller direction for propulsion to basically control the force of gravity against the quadcopter. The spinning of the quadcopter propeller blades push air down. The faster the rotor spins, the greater the lift and vice-versa.



b) Hover Still: To hover, the net thrust of the four rotors push the drone up and must be exactly equal to the gravitational force pulling it down.

c) Climb Ascend: By increasing the thrust of the four quadcopter rotors. So that the upward force is greater than the weight and pull of gravity.

d) Vertical Descend: Dropping back down requires doing the exact opposite of the climb. Decrease the rotor thrust or the net force is downward.

Summary: In this experiment, the Rotational effect of propellers blades on drone flight has been carried out. Clockwise and counter clockwise effect due to the propeller blade has been carried out. Also, the role of propeller blades in motion control has been studied.