Fundamentals of Autopilot on an Airplane (Prototype)

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Abstract—*The protoype is an scratch built Airplane & is designed mainly to glide for a longer a time after the propellers of the Protype are set to idle.It has a capability of glding for more than 120 seconds.The plane has been designed with larger wing chord to increase it gliding time.The protype type has a larger momentum from the wing to the tail of the plane and has a higher angle of attack during landing ,which helps the protype to be manovered during cross wind conditions.*

The Protype uses Four servos for moving the Ailerons, Elevator & Rudder and an Electronic Speed Controller & brushless Motor.The protype uses a 2.4 Ghz Tx/Rx Module for Manual flight control upto a range of 1.5 Km radius.

The receiver Rx is connected to the APM module. All the Channels in the Rx from Chanel 1 to 6 are connected to the APM and the APM channels are connected with all the four servos and the ESC (Electronic Speed Controller).TheAPM can be only be armed from the Tx (Transmitter) using the right Rudder for both Activation/Termination.

When the APM is not armed the flight controls of the Prototype is in Manual mode and can take off manually. The APM has a Gyroscope which helps the plane to level with the Horizon as soon as it takes off. The Gyroscope helps the plane to have a stable flight, it also maintains the Altitude of the plane.

When Maneuvering the plane Manually Right or Left Up and Down it returns back to its mean position after completion of the Operation from the Tx during manual Flying.The Gyro also protects the plane from stalling in Cross wind Conditions.

The APM has a GPS connected to it and the Compass of the GPS is aligned with the Nose of the plane.

Asynchronous Programming Model (APM) is programmed using C Programming.Using the Mission Planner tool the APM can be programmed with a Auto Take- off & Landing Mode.

Way points can be set on the APM with Altitude Climb and Decend upto a radius of 5 Km as tested.

Once the waypoints are set and the APM is armed the plane switches to Autopilot and navigates using the GPS to the Destination and then returns back to its First Position.

Setting the turning radius is critical on the mission planner and is done following the capability of Plane to take a turn towards the next waypoint.

As Tested the Prototype is capable of reaching altitues upto 700ft – 800 ft .

Asynchronous Programming Model (APM) in the plane is also connected with a FPV Telementry Tx/Rx Module which gives live video from the Camera Onboard the plane.The FPV telementary Tx/Rx module is 2.4Ghz and is capable of giving live video upto a range of 2Km radius.The FPV can also be used when the APM is unarmed for Manual flying.

This Prototype Aero-model can be used by Security agencies and the Army for monitoring a vast Area in a very short time.

ADVANTAGES OF AN AIRPLANE FROM A MULTIROTOR/QUAD ROTOR

As the Plane's structure is completely Aerodynamic and is capable of flying even when there are glitches in the signals from the Tx .During a glitch or GPS navigation failure the Pilot will have enough time to recover the plane from a stall or a nose dive but in Multi Rotorrs or Quad Copters where the the structre has zero Aerodynamics ,falls off the sky in case of any malfuction with the GPS or connecting the Tx/Rx .The Propellers and Brushless Motors in the Multirotor keeps it Airbourne once they fail it stalls and falls from the sky.