How To Build An Unmanned Aerial Vehicle/Aircraft System (Drone)

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Introduction

Terminology

UAV stands for Unmanned Aerial Vehicle. It is also known by the name “Drone” and it is also referred by various names is basically an RC airplane excluding a human pilot onboard

History

Earlier products in the UAV world have limited capability in controlling and handling side and because of which most the aircrafts gets crashed, it might be a reasoning of lacking auto-landing feature and lack of artificial intelligence control. Due to this flaw, human casualties take place. Nowadays, as UAV’s (Unmanned Air Vehicles) have become a significant source for surveillance, military purposes and artificial intelligence .

Classification

The drone we are using to build in our project is a “Fixed Wing RC Plane”. A fixed wing aircraft has benefits as well as drawbacks in contrast with rotor-craft. Fixed wing aircrafts have been proved to perform really well in the air despite the presence of piloting as well as technical faults (errors) since they possess by nature gliding features which doesn’t require power.

Equipment And Materials Used

Selecting Material for Aircraft Body

We consider balsa wood as because balsawood is too light weight, in low cost and according to observation balsawood has less weight that provides aircraft good thrust to weight ratio. The other advantage of using plywood is that in construction of plywood there is a slide layering of

wood that glue And that slight layering of wood prevents plywood for breaking , deforming and buckle that provide strength to wood.

Aircraft Wing Material

For the fabrication of aircraft wing we require that material having less weight than wood. As approach is that to make aircraft as low weight as possible Hence thermo pole sheet is utilized.. Advantages of using it is that thermo pole is of low weight having low cost as compare to balsawood that gradually effecting on cost and helping our team to achieve a task of making low weight aircraft to make it fly .But using of thermo pole may cause strength can become low .Here additionally were recover that state of being weak by covering the thermo pole with three layer of special liquid fluid The construction of this glow is mixing (40% white epoxy with 40% yellow epoxy and 20% ordinary thermo-pole glue) mixing it in result yellowish sticky fluid will appear. That fluid is our special fluid making thermo pole water resistant, heat resistant and extremely strength having light in weight.

Selection of Airfoil

In fabrication of wing the first step is to select airfoil geometry here we select symmetrical airfoil because the lower and upper surface of symmetrical airfoil is of same level it means center of pressure will be minimum; our team used PROFILI 2.6 software for the designing and selection of airfoil.

PROFILI Software

Our team selected Symmetrical airfoil.Symmetrical airfoil has congruent equal matching of upper and lower surfaces. Symmetrical airfoil subjected to only those wing application which having capableofturningaroundonanaxis .the reason is that center of pressure travelling is equal to zero at various angle of attack with having high lift to drag ratio and high range of velocity from tip to root .

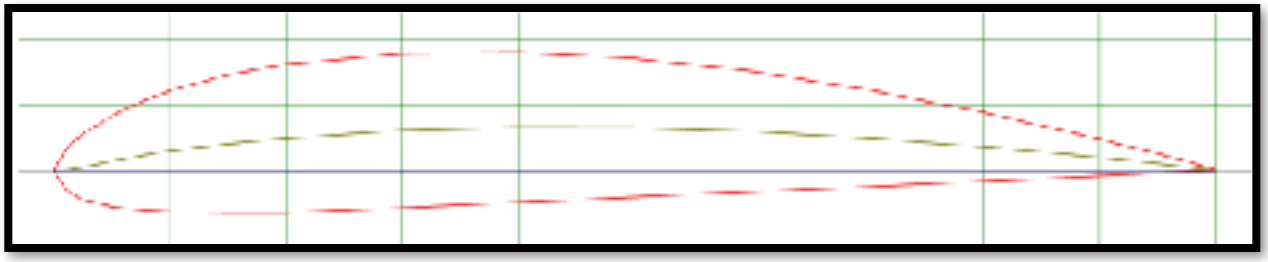

Fig 1: (Indicating the output come form profile software for the designing of airfoil)

Definitions

"An unmanned aerial vehicle is an aircraft piloted by remote control or onboard computers"

Instructions

UAV components

APM 2.5 gadget contains a new enclosure layout and power gadget with unified 5.3V regulator with both the sensing of current and voltage. APM 2.5 is in itself a complete autopilot gadget. It permits the concerned operating person to navigate any fixed, rotary wing as well as multi-rotor based vehicle (including cars as well as boats) into a complete autonomous vehicle featuring computer programmed GPS mission with set waypoints. It permits a huge collection of further parts to be consumed by the usage of several different connectors and transmitters to grant access for various purposes which is dependent upon the user choice.

Body

Fuselage

It is commonly known as the backbone of a model. It is that part to which the wing, horizontal and vertical tail are attached. Engine is also placed in the fuselage. It is built up of heavy joints often referred as heads.

Wings

The top-most physical structure responsible for pulling up the plane is known as wings. The wing delivers lift due to the aerodynamic symmetry that produces a differential pressure form resulting in lift.

Engine

It is the power generation unit of UAV. The power generation UAV plane units may include electric motors, internal combustion gas engines and jet/RC engines. The engine is installed in the UAV and it delivers thrust to the UAV . Thrust makes it possible for the plane to travel towards front via air. The engine is responsible for rotating the propeller.

Propeller

The propeller is generally a wings part built up of airfoil regions similarly as a wing however it is curled/bent adjacent to the span. The propeller is installed in the engines of only those planes who are propeller operational. Similarly UAV which operate through jet engines doesn’t have propeller and hence thrust is produced with the help of the jet engine.

Ailerons

The handling regions that have the capability of roll controlling/handling are known as ailerons in model planes. Ailerons produce roll by rolling around in different trajectories with one another.

Elevators

The handling regions that have the capability of pitch controlling/handling are known as elevators in planes. Elevators deliver pitch handling by acquiring upward/downward positions at the same time which results in the plane to do pitch at the center of gravity of the plane. When upward position is attained by elevator then the UAV model nose acquires upward slope also considered as pitch up. When downward position is attained by elevator the UAV model nose attains downward slope also referred as pitch down.

Rudder

The handling regions that have the capability of yaw controlling are known as rudders in UAV air-plane. It delivers yaw controlling/handling by acquiring positions; it can be left/right.

Nose gear

It is a sub part of the main landing gear installed on specifically standard arrangement. It is to drive the UAV plane nose to turn the UAV plane left or right when it is stationary on ground. The servo that joins the nose gear; furthermore it is joined with the rudder too. Thus; the trajectory in which the rudder performs the nose gear movement, it too acquires that trajectory.

Landing gear

The major gear system of the wheels that is responsible for landing the plane to the ground is the main/landing gear. Main/landing gear must be firm enough and should also be pliable enough to deliver harmless take-off and landing to the model plane. A hard not pliable landing gear can cause destruction to the UAV model plane body since the whole load of the body would ultimately be faced by the fuselage.

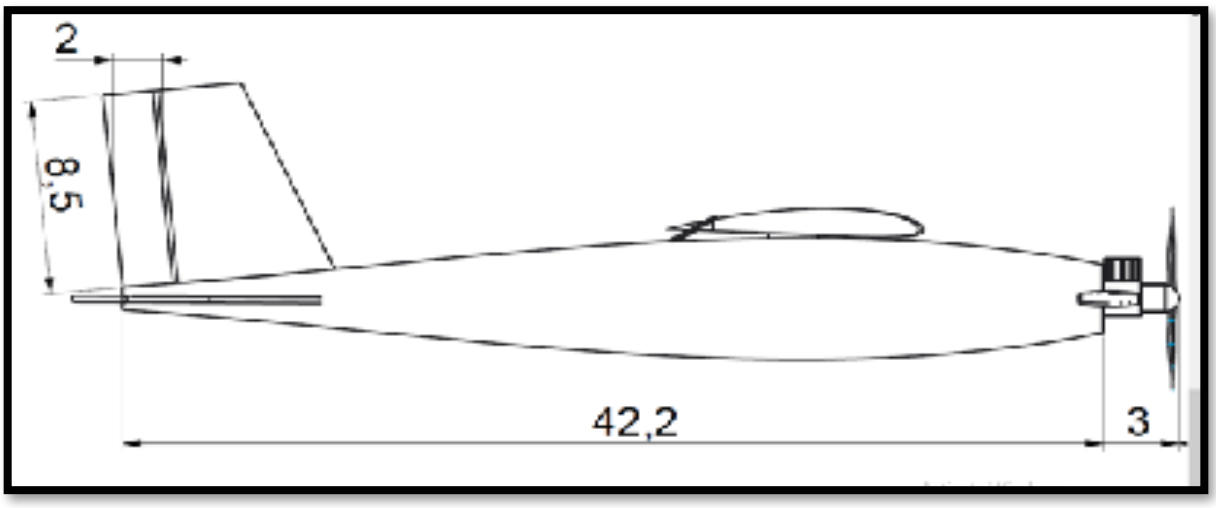

Fig 2 : (Indicating the whole body structure of UAV)

Power supply and platform

APM 2.5 Powering

Just as any normal computer, APM also requires a supply of power with a constant flow of voltage and adequate current. APM gadget has the ability to provide 2.25A at 5.37V. The device is made in such a way that it is to transform power through the major flight battery (power) which is 18volts max. That gadget will provide adequate power to APM; also to low power radio components involving the receiver (excluding servos). The UAV receiver can take

power from any input of APM i.e. +5v and ground. This is usually achieved by connecting a 2/3 cable wire in between an input of APM and one of channels of output on the radio of the UAV plane ("ArduPilot Mega", 2016, p.n.d).

3DR Power Gadget

It is utilized for calculating consumption of current and voltage of battery; hence in REAL TIME we can easily obtain information regarding level of battery of ourUAV. It's basically used as a safe flight technique of our plane ("3DR Power Module", 2016 ,p.n.d)

Computing

3DR Telemetry Radio

Telemetry is the remarkably computerized communications technique through which measurements are done and all other data that is collected at the remote / inaccessible points and then transmitted to receiving devices for the purpose of monitoring. Though the term normally points to the wireless mechanisms of data transferring; flight testing programs normally monitor that data which is collected from on-board. This type of data is then monitored in real time; for safety precautions and also to deliver feedback to the test-pilot. Challenges that are faced during telemetering this type of data involve multi-path propagation, Doppler's effect and fading respectively("3DR Radio v1", 2016 , p.n.d)

GPS 3DR UBLOX NEO-6M-0-001

The NEO-6 gadget family is a series; having the capability of operating independently of GPS receivers presenting unbelievable great performance U-BLOX 6 positioning; engine. Their miniature architecture, memory and power options prepare it ideal on battery operational mobile appliance which has space constraints and very strict cost.

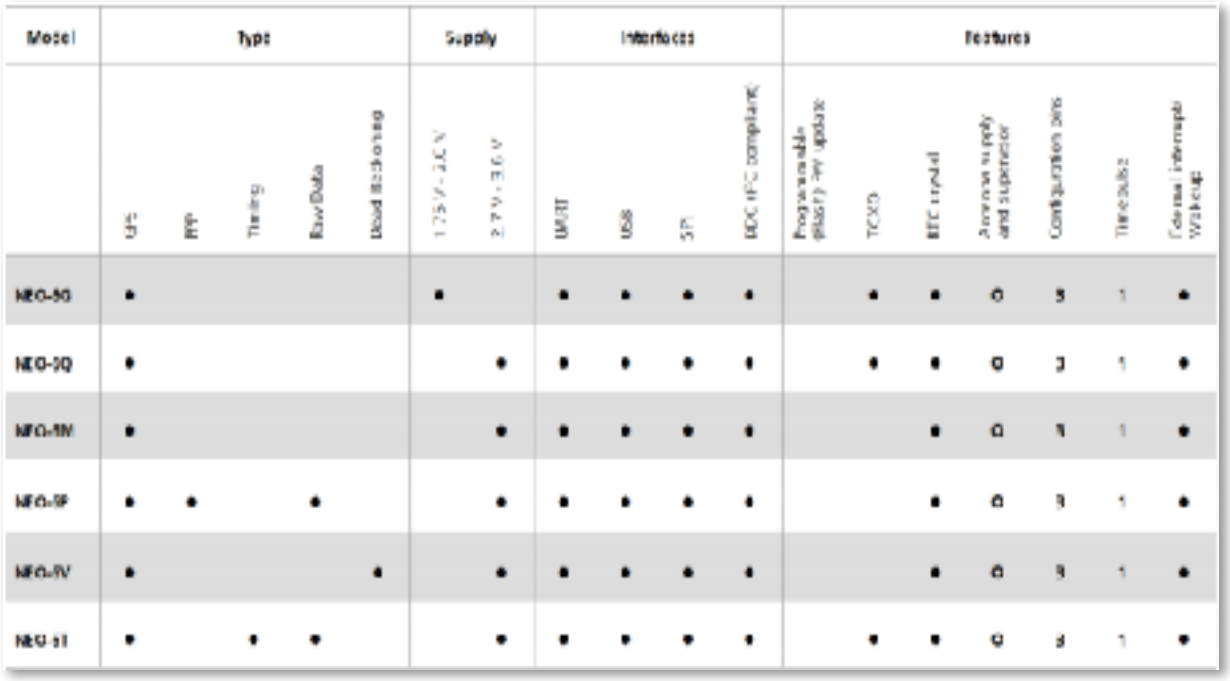

Fig 3: (Indicating the voltage level for various GPS)

Source :("NEO-6 u-blox 6 GPS Modules", 2016 ,p.n.d)

Sensors And Actuators

Inside APM 2.5,there are built-in sensors and actuators present .The description of APM 2.5 sensor and actuators are following:

- ➢ Compatible on ARDUINO.

- ➢ Contains 3-Axis Gyro, accelerometer, magnetometer also involving tremendous performance barometer.
- ➢ Also includes 4MB flash chip for storing data for automated data logging session.
- ➢ Alternative off-board GPS, Media-TEK MT3329/U-BLOX LEA-6H module (Media-TEK coming in low price.
- ➢ It is one of the first-most open source autonomous platforms to work with.
- ➢ Barometric pressure sensor modified to MS5611-01BA03.
- ➢ Kit contains telemetry lead, Micro USB data lead, DF13 6 Position connector for the Power Module and GPS connector lead.
- ➢ Things which also included in the Kit are all the components of the 3DR Radio 433 MHz Telemetry set.

Software

Each and every flight mode possesses extra optional controls that may be utilized to alter the behavior or performance to meet specific flying purposes. Using mission planner software, we can plan mission for UAV ("Mission Planner", 2016 ,p.n.d)

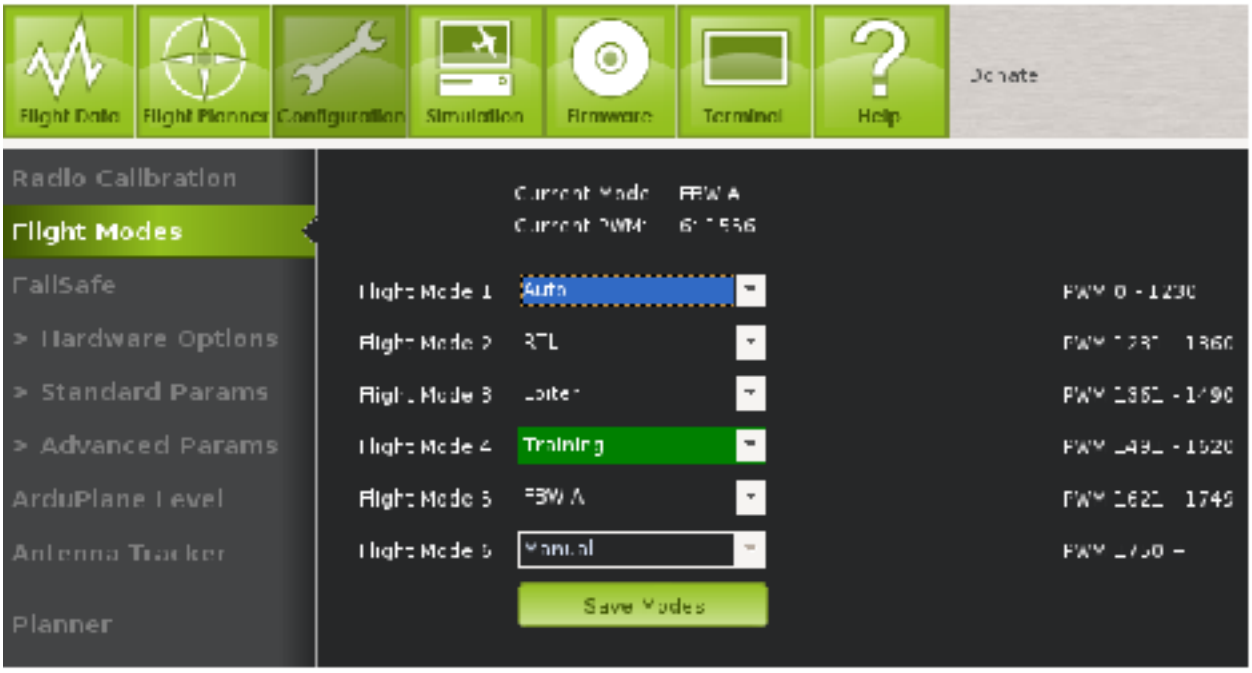

Fig 4 : (Representing the mission planning strategy)

Source :("Mission Planner", 2016 ,p.n.d)

Loop principles

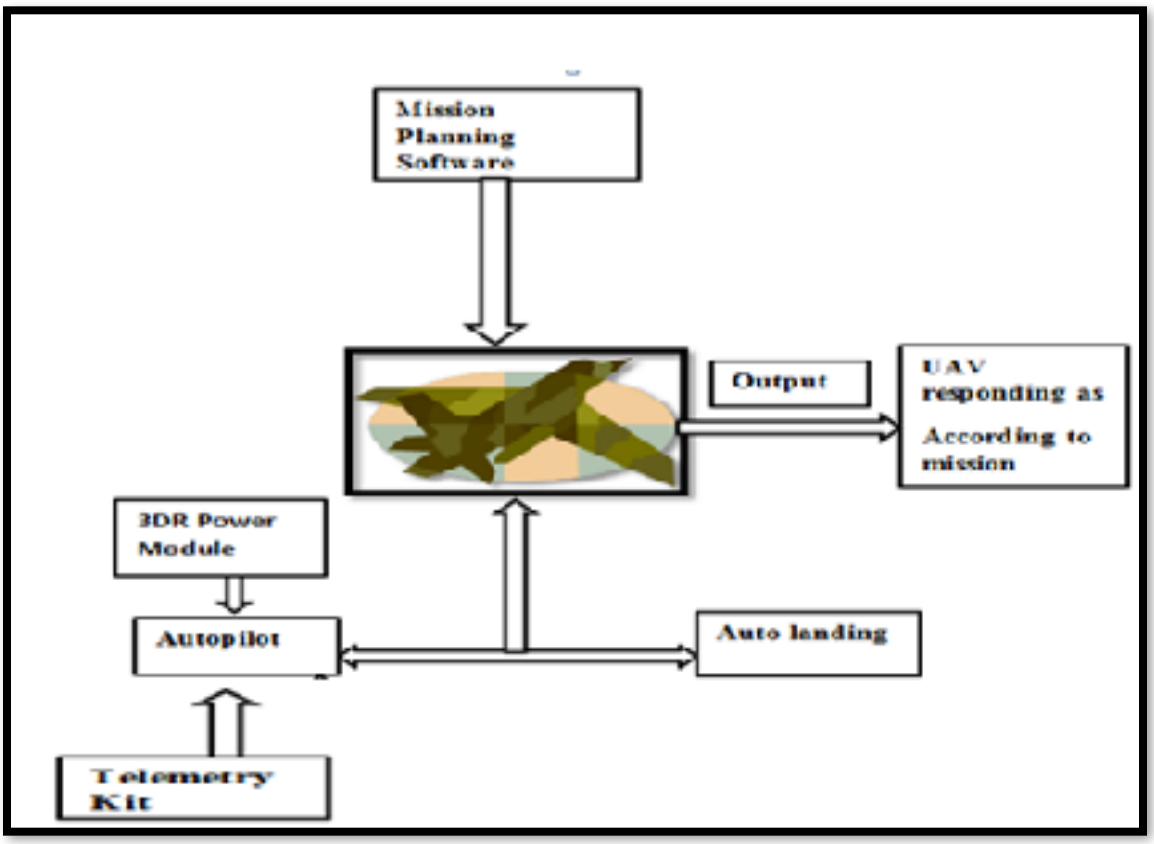

Fig 5 : (Representing complete procedure towards mission execution)

Flight controls

Plane possesses a vast variety of flight controls which are already built in. Plane can be used as a sophisticated auto-pilot, normal and simple flight stabilization system, a flight safety system or a training system which entirely depends on what preferences and flight-modes you have chosen. The radio is used to control the flight-modes (through a “transmitter switch”) through “GCS (Ground-Station Commands)” or through “Mission-Commands”. When you setup your radio to get the control of APM’s flight modes, utilize your flight mode setup screen of ground station. Utilize the configuration: Flight Modes screen in “Mission-Planner”("Mission Planner Flight Plan", 2016, p.n.d).

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