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Auto Pilot Controlled Flying Wing (UAV) For QRF (Quick Reaction Armed Forces)

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Abstract: *An UAV (Unmanned Aerial Vehicle), or the drones, or the RC aircrafts are now a days in trends with the hobbyists, armed forces or the kids for playful purposes. But if we see look around us, we will find that these drones can help us in day to day life in saving some life which are in danger. Drones are prepared on the basis of some particular application like aerial photography etc. But we the upcoming engineers should hold our responsibilities and prepare something useful for the man on the front that could be a great serving for the nation and as well as for them who really need this equipment for safeguarding our motherland.*
Keywords: *UAV (Unmanned Aerial Vehicle), Drones, RC (Radio Control), Ariel Photography, Hobbyists.*

I. Introduction

The auto pilot controlled flying wing UAV is designed for the quick reaction armed forces. For the surveying of areas affected by natural disasters like earthquakes, tsunamis, floods etc. and it can also be used for aerial photography of agricultural lands and in any type of terrorism active areas. It will become more helpful to our armed forces that can operate this vehicle in enemy territory without leaving any heat signature in any kind radar due to its low heat signature design. It is having very high speed of maneuver and more than usual time of flight than any other RC controlled UAV that makes this design more accurate for armed forces QRF division. QRF divisions can use this UAV with an ease. It doesn't require any bingo fields (Places to land), and can be hand tossed from any moving vehicles, its body is fabricated in such a way that it cannot break during minor crashes. Moreover the auto pilot enables the controller to recover the vehicle easily & where ever he/she wants.

Figure 1 (1St Test Prototype)

II. Parts of Flying Wing

2.1 Fuselage

It's the central part of the flying wing where all the electronic parts are positioned with respect of the center of gravity of the entire aircraft. Fuselage serves a very crucial part in the flying wing; it not only holds the electronic parts but also position the wings of the aircraft through carbon fiber rods. In this design no can find or identify the fuselage as it is completely hidden from the outer environment. The body of aircraft is completely fabricated in two parts which is its wings and fuselage as a combined additive.
Auto Pilot Controlled Flying Wing (UAV) For QRF (Quick Reaction Armed Forces)

2.2 Wings

Wings are the most crucial part of the flying wing drone. Wings and body of flying are the same and can't be distinguished. In flying wing drone two same size wings are attached together to form the fuselage & body of the drone. Wings play a key role in lift. Wings generate the lift required to keep drones in air. Lift occurs as the plane is pushed through the air. The top part of the wing is curved while the bottom is straight.

Which cause the air on top to move faster, the faster moving air on top of the wing creates a low pressure that lifts while the higher pressure on the bottom of the wing.

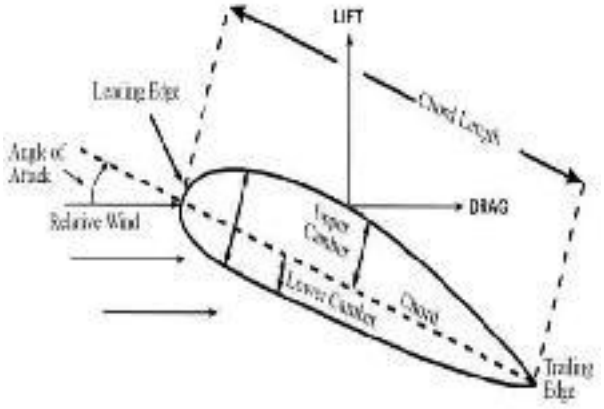

Figure 2 (Aerodynamic Forces Acting On The Wing)

Wing Span	2b	95 cms	Tip Cord	λ	18 cms
Root Chord	c 0	26 cms	Weight	G	400 gms
Mean Aerodynamic Center	MAC Distance	20.2 cms	Wing Area	S	2 1892 cm

Table 1 (UAV Data)

2.3 Aero Foil

An aero foil is the term used to describe the cross-sectional shape of an object that, when moved through a fluid such as air, creates an aerodynamic force. Aero foils are employed on aircraft as wings to produce lift or as propeller blades to produce thrust. Both these forces are producing perpendicular to the air flow.

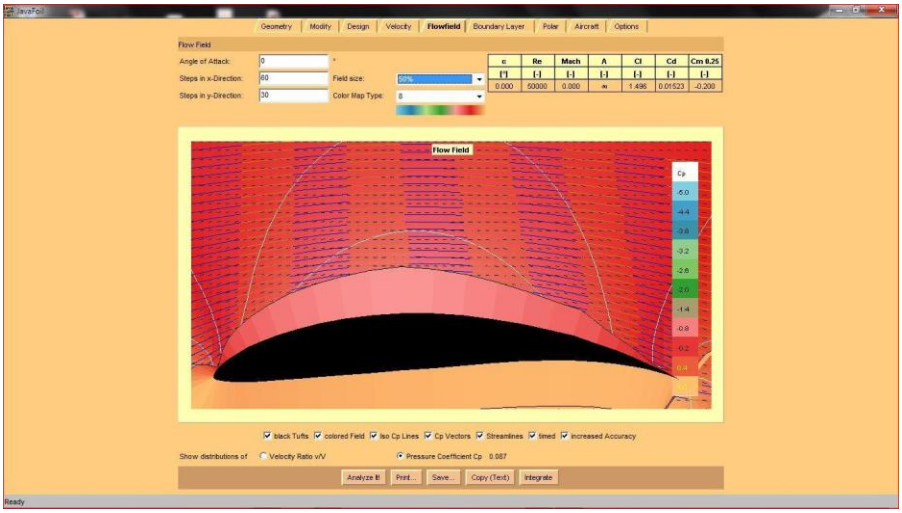

Figure 3 (Foil Analysis Calculating Pressure Gradient On Java Foil)

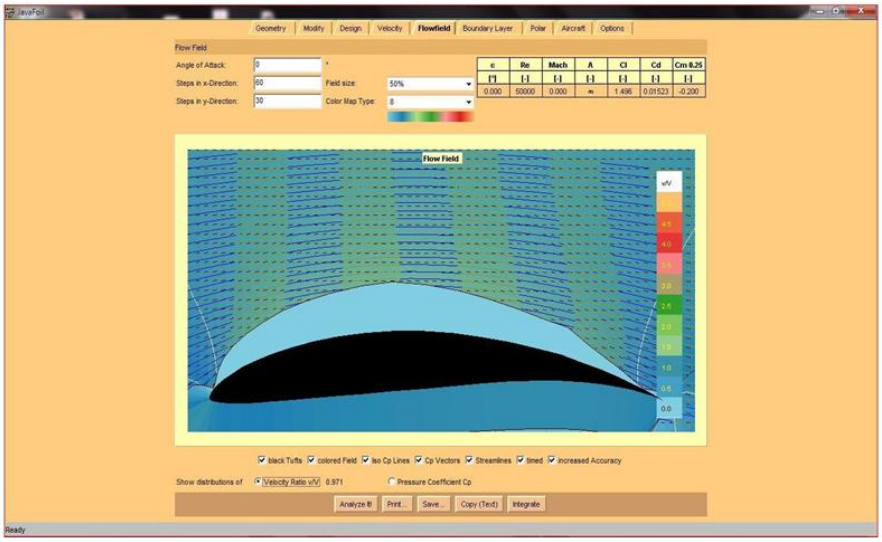

Figure 4 (Foil Analysis Calculating Velocity Ratio On Java Foil)

In java foil, the foils created on the Auto CAD can be imported directly for analysis purpose. The analysis report shows the pressure coefficient and the velocity ratio of the air to the aircraft. This help in easy analysis of the wing that it can sustain into the flight in the air or not. Java foil analysis also shows up the velocity gradient of the aircraft.

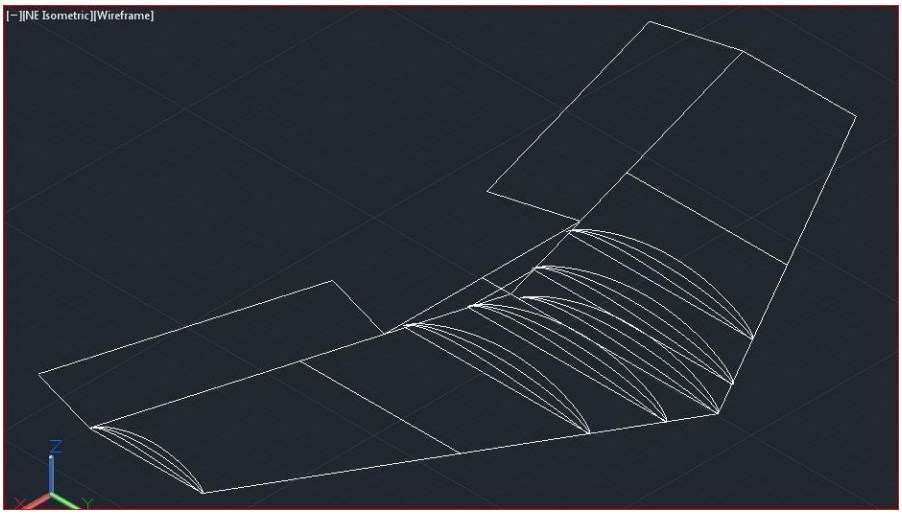

Figure 5 (Wireframe Model of Flying Wing With Aero Foils)

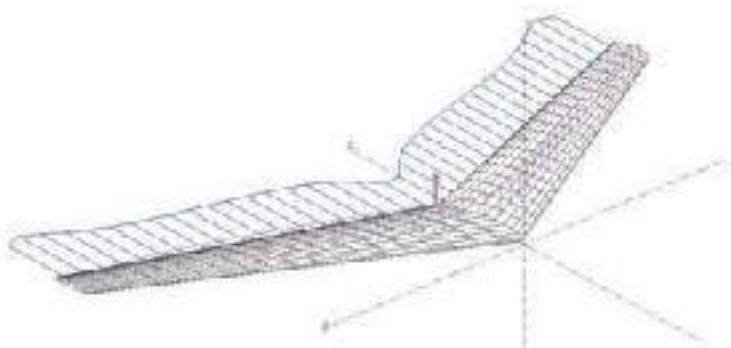

Figure 6 (Lifting & Drag Diagram 55 km/hr @ 7^{o} of Incidence)

III. Automation Through Laptop Interface

Automation is enabled in the flying wing with help of a hardware Ardu Pilot and software interface called the Mission Planner. Mission planner helps us to establish control on the plane. The Mission Planner, created by Michael Oborne, does a lot more than its name. Here are some of the features:

1) Point-and-click waypoint entry, using Google Maps/Bing/Open street maps/Custom WMS.
2) Select mission commands from drop-down menus.
3) Download mission log files and analyze them.
4) Configure APM settings for your airframe.
5) Interface with a PC flight simulator to create a full hardware-in-the-loop UAV simulator.
6) See the output from APM's serial terminal.

Figure 7(Mission Planner's Demo Mission)

IV. FPV Introduction (First Person View)

In FPV (first person view) system, a wireless camera is attached with the transmitter working on 2.4 GHZ frequency that can transmit data up to a range of <250 meters. This system is mounted on the flying wing on the front of the nose or on the bottom CG of the UAV. This unit has a sub part called as the receiver of the system. The receiver is used to receive the signals transmitted from the transmitter of the camera, and then it converts the signals & flashes them on the portable monitor or screen. This secondary system is also called as the ground station or the ground unit. When the pilot is flying the UAV and wants to see what the drone is seeing and where it is heading after getting away from the line of sight of the pilot. This system is useful when you are far and want to trace the target site. Or get visual from enemy territory. It's easy to use and very handy.

Figure 8 (Skyzone FPV KIT Used)

V. Conclusion

Conclusion is straight and clear that we require this kind of low profile drones equipped with FPV units combined through Laptop synchronization, that are the key to victory in war zones. Easy to handle and require less skilled personnel for flying this drone. The main feature is that if we manufacture the entire technology in India the cost reduction will boom the units and cost per unit will be smashed by 50-70%. So the low cost drones are the needs of Indian airspace and more over the combat troops can use it on any terrain and in any kind of weather which will allow them to carry their combat operations in any environment.

Figure 9 (Actual K- Knight Drone of FIZ Club ITM GOI)

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