THE DESIGN OF AN UNMANNED AERIAL VEHICLE

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Abstract--- This paper focuses on the design, modeling, implementation and testing of an autonomous unmanned aerial vehicle. The controller is based on an combined with circuitry to switch control between the RC control and the autopilot control (that's the multiplexer /failsafe, also known as MUX).This control navigation (following GPS waypoints) and altitude by controlling the rudder and throttle. The system uses flight stabilization system (co-pilot),a sensor pack ,Global Positioning System(GPS) and an RF transceiver to monitor and report crucial parameters such as altitude, speed ,pitch, roll, and position. An embedded software algorithm has been developed to enable the aerial vehicle accomplish the required autonomy and maintain satisfactory flight operation

Keywords— GPS, MUX, UAV, FMA Copilot

I. INTRODUCTION

Introduction to flight Mechanics Airplane flight mechanics can be divided into five broad areas: Trajectory analysis problems involve small aircraft rotation rates and are studied through the use of the three degree of freedom (3DOF) equations of motion Stability and control studies are concerned with motion of the center of gravity (cg) relative to the ground and motion of the airplane about the CG. Airplane sizing involves an iterative process, and Simulation involves the numerical integration of a set of differential equations. Flight testing is the experimental part of flight mechanics.

METHODOLOGY MECHANICAL STRUCTURE

The approach adopted for the design of airplane uses the combined knowledge of aerodynamics engineers and lightweight model airplanes designers. The starting point for this design was the model airplane of Walter Engel that holds the world record for flight duration of over 15 hours with 1 kg of battery. The resulting total weight including motors, propeller, solar cells, batteries and controller is around 2.5 kg.

Principle behind Unmanned Aerial Vehicle

Unmanned Aerial Vehicle works on the principle of
1. Aerodynamics (forces are Lift, Gravity force or Weight, Thrust, and Drag.) and
2. Newton's third law.

A growing area in aerospace engineering is the use and development of Unmanned Aerial Vehicles for military and civilian applications .There are difficulties in the design of these vehicles due to the varied and non-intuitive nature of the configurations and missions that can be performed. Currently there has been a huge demand for UAVs and services for real time and remote sensing .Unmanned aerial vehicles can be deployed to solve a number of civilian tasks ,it can be used as an effective means of search ,detection and identifying of objects or subjects of interest as well as their precise coordinates. UAVs are also very useful in disaster management, in the occurrence of a forest fire for instance , it is very difficult to have a precise data on the development of the situation ,but with the deployment of a UAV which is capable of flying at low altitudes and able to navigate with GPS waypoints and machine vision ,the situation can be controlled very efficiently,

Control Throws: Low Rate High Rate
Elevator, Up and Down 6.35mm 11mm
Rudder, Right and Left 9.5mm 15.9mm   Ailerons, Up and Down 6.35mm 6.35mm

GROUND STATION/AERIAL VIDEO SYSTEM.

The ground station/monitor consists simply of a laptop computer that is used to display the video stream sent by the UAV.

The Aerial video system (AVS) used is AVS-KX171 Camera. The Aerial Video System is a complete wireless video kit.

Fig-1

SPECIFICATIONS:

Aerial Video System, 900MHz frequency, 500mW RF output power, 12V camera
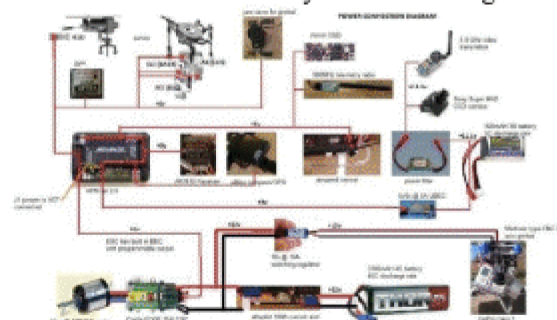
Aerial Video System Block Diagram

Fig-3

Results

In this paper, I have discussed the design and implementation and simulation of based UAV system.

The simple UAV has the ability to implement autonomous flight (automatic take and landing).The developed UAV has been tested successfully in both manual and automatic flight operations. Useful data has also been obtained by the use of computer vision, i.e. the Aerial video system and valuable data has also been obtained by the use of telemetry.

Condition for flying

It is strongly recommended to get the assistance of a qualified, instructor, who will assist in the basics of Radio Controlled flight. The flight instructor holds a trainer switch down which control the model.

Secondly one has to ensure whether battery is fully charged since attempt should not be made to fly the model on a partially charged battery,
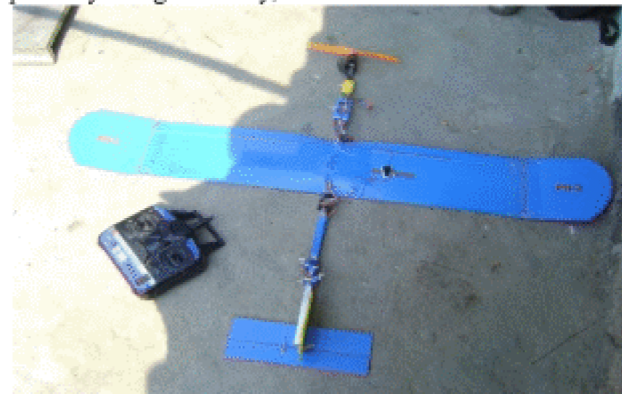

Fig-2

II. CONCLUSION

The present study enumerates the design of simple unmanned aerial vehicle using low cost materials including its mechanical structure, the solar generator and the autopilot system. The approach adopted doesn't aim only at building an efficient autopilot, but also keeps in mind its future application. This is done by designing and selecting all the parts to obtain a lightweight and low-power airplane. We plan to develop this model for high configuration in the near future.

FUTURE WORK

Presently waypoints can only be entered pre-flight and manually, this limit the autonomous properties of the UAV .It would be very useful to develop a method to reprogram the waypoints on the controller board mid-flight. Power consumption is another issue worthy of considering, presently the power rating of the UAV will last only for several minutes without recharging, it would be great if the power rating of the UAV could be reasonably increased. Two methods worthy of consideration is 1) the use of solar panels for recharging mid-flight, 2) the use of automatic recharging, i.e. having the UAV taxiing into predetermined destination and recharging on its own then taking off. This would require the addition of extra electronic components which could drastically affect the weight of the aircraft and could also give rise to magnetic interference.

REFERENCES

[1]   Introduction to UAV Systems, Paul G. Fahlstrom, Thomas J. Gleason

[2]   http://www.diydrones.com DIY Drones

[3]   UAV Annual Report, DARO, November 1997

[4]   Remotely Piloted Vehicles, Twelfth International Conference, Bristol