

SIMPLE UNMANNED AERIAL VEHICLE DESIGN

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Abstract- In recent year the use of Unmanned Aerial Vehicle (UAV) proliferated, in support of all types of combat missions. Today, UAVs are performing various services, including intelligence information gathering for tactical and national level, maintaining patrols on homeland security and maritime surveillance missions. The present work focus on the steps to build an unmanned aerial vehicle that is capable of an unassisted landing and patrolling a defined area of ground. It can be used for the purpose of spotting a person in a restricted area, or to search for and find a target. The main advantage of the model developed is, it is based on the concept of simple radio controlled airplanes using low cost materials without time consuming and painstaking process.

Key Words:Surveillance, patrolling, radio controlled.

1. 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

2. Methodology

2.1 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, 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.

3. Materials and Methods

Basic Materials Needed

The following are the materials used for building sky sailor are:

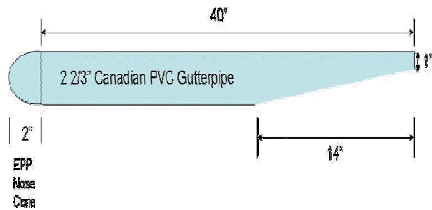
1. 4' x 8' sheet of coroplast.
2. 4 yardsticks.
3. 2.5" square P.V.C. gutter pipe.
4. Zip ties (for servo attachment).
5. Medium CA glue.
6. 1/4 dowel for wing hold downs and push rods.
7. Self tapping screws.
8. Smaller screws for control horn attachment.
9. Double sided foam mounting tape for servo attachment.
10. Motor, Mount, Pushrods.

Basic Steps to Build UAV

Fuselage

The fuselage is the first thing that needs to be constructed, and then the rest of the plane can be built around. The most common material used to build the fuselage is PVC gutter pipe. The gutter pipe is lightweight, durable and very cheap compared to balsa wood and plywood. The fuselage should first be cut to the desired length based on the size of plane to be built.

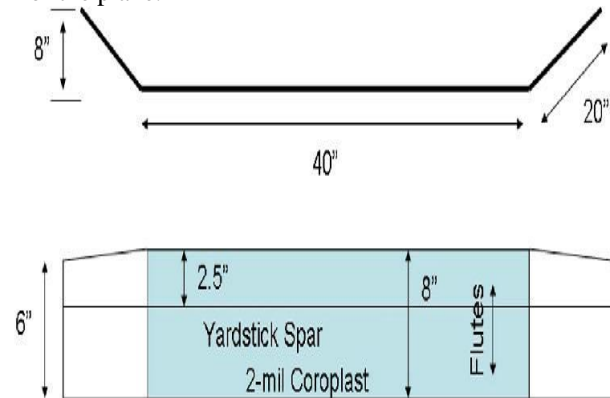
After cutting the fuselage to length, next step is to fit servos and radio equipment. Next step in building UAV is to design the wings. The tail wings are simply a flat piece of coroplast cut to the desired shape of the wing.



The mechanical structure of the airplane is actually ready; it has been successfully tested and validated in terms of power and stability.

WINGS:

After constructing the fuselage now you can build the wings for the plane.



The tail wings are simply a flat piece of coroplast cut to the desired shape of the the wing. It is the main wing that sometimes causing confusion. Using the yardsticks as wing spars, cut the coroplast to the desired size and then fold it into a wing shaped around the yardstick. Each side of the wing should be constructed separately and then using a section of another yardstick set the dihedral of the wing and glue them together. Then cover the gap where the two halves of the wings join with a thin strip of the coroplast. For the more

advanced wings ailerons would be added but to keep it simple on the first plane they should not be added.

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.

4. 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.

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