Remote Controlled Aircraft for Surveillance

Amit Adarsh[1] Kumar Saket[2] Santosh Nishad[3] Dileep Kumar[4]
[1,2,3]Student [4]Assistant Professor
[1,2,3,4]Department of Mechanical Engineering
[1,2,3,4]Nagarjuna College of Engineering and Technology, Bengaluru, India

Abstract— Now Requirement of system which can monitor, Surveillance and react to the situation appropriately based on requirements in military and civil application. This technology will be able to provide solutions for infiltrations in border areas, collect information, transmit data back to the base camp. this system Also plays a very important role in civil sectors, for collecting deep forest, deep see, and Arial data for weather predictions and other research works Technology has been upgraded and updated from past many decades' time to time. Even as the world powers are concentrating more on research and developments in Defense sector, a Military and a civil based technological development is in dew. RC controlled surveillance aircraft will be a completely new concept which can be termed as multipurpose drone for various on ground, air and water surveillance and other requirements.

Keywords: Surveillance; RC Controlled Surveillance Aircraft

I. Introduction

Technology has been upgraded and updated from past many decades time to time, nevertheless there is a striving requirement for more advancements in the coming near future. Even as the world powers are concentrating more on research and developments in Defense sector, a Military and a civil based technological development is in dew. The RC controlled aircraft is a state of art cutting edge technology that can be used for Military as well as civil based applications depending upon the requirement in different sectors. It is an all-weather and all terrain system capable of countering rough and rugged situations. Earlier there has been very little research done on such a technology which is a very important requirement in different sectors. RC controlled surveillance aircraft will be a completely new concept which can be termed as multipurpose drone for various on ground, air and water surveillance and other requirement.

A radio-controlled aircraft (often called RC aircraft or RC plane) is a model aircraft that is controlled remotely, typically with a hand-held transmitter and a receiver within the craft. Piloting a RC plane is like controlling your own air strike force. You are in complete control and awaiting commands. If you are interested in electronics or mechanical devices, the advanced designs and components of RC planes will fascinate you. Flying radio-controlled planes is actually quite an exhilarating hobby. RC planes encompass a number of different areas of excitement, both technical and artistic. No other hobby allows you to become involved in so many diverse skills and topics, such as woodworking, electronics, small motors, aerodynamics and the great outdoors.

A. Working Principle:

Signal inputs are given from the transmitter to the onboard receiver. The receiver converts the input signals into mechanical output. Initially the motor generates enough thrust for the aircraft to take off from the ground. Once the main landing gear loses the contact with the ground surface the controller starts wing corrections with the help of ailerons. After the aircraft gains enough altitude it is leveled off and bought into the cruise phase. After achieving the objectives of the flight, the aircraft is bought in to a halt by landing procedure.

II. Objectives

- To provide an unarmed aerial vehicle (UAV) which are highly efficient, low cost, environment friendly surveillance.
- The stated objective is achieved by designing the UAV and then developing physical model capable for desired mission.
- After the design and analysis of the UAV, fabrication of an aircraft will be done which can be used by military for surveillance.

III. Materials and Methodology

A. Materials

Materials used for the fabrication of RC controlled aircraft is tabulated below.

Sl. No.	Material	Specification
1.	BLDC	1000 kv ,4000 rpm
2.	ESC	30 amps
3.	Radio transceiver 6 channel	2.4 ghz
4.	Lithium Battery	12volt 2200 mill amps
5.	Servo motor	6 nos 9 grm digital
6.	Propeller	10x4.5inch
7.	Charger	B 6 100 w
8.	Depron sheet	5mm thickness
9.	Covering film	2mm
10.	camera	Action Camera 1080p resolution
11.	Transmitter	

1) BLDC motor

A brushless DC motor (also known as a BLDC motor or BL motor) is an electronically commuted DC motor which does not have brushes. The controller provides pulses of current to the motor windings which control the speed and torque of the synchronous motor.

These types of motors are highly efficient in producing a large amount of torque over a vast speed range. In brushless motors, permanent magnets rotate around a fixed armature and overcome the problem of connecting current to the armature. Commutation with electronics has a large scope of capabilities and flexibility. They are known for smooth operation and holding torque when stationary.

Fig. 1: BLDC Blade

2) ESC

An Electronic Speed control or ESC is an electronic circuit that controls and regulates the speed of an electric motor. It may also provide reversing of the motor and dynamic braking. Miniature electronic speed controls are used in electrically powered radio controlled models. Full-size electric vehicles also have systems to control the speed of their drive motors.

3) Servo Motor

A Servo is a small device that has an output shaft. This shaft can be positioned to specific angular positions by sending the servo a coded signal. As long as the coded signal exists on the input line, the servo will maintain the angular position of the shaft. As the coded signal changes, the angular position of the shaft changes.

Fig. 2: Servo motor

4) Transmitter

A transmitter is an electronic device which, usually with the aid of an antenna, propagates an electromagnetic signal such as radio, television, or other telecommunications. When talking about rc transmitter modes we are referring to how the transmitter is set up to control the airplane which sticks operate which controls on the model.

Fig. 3: Transmitter

5) Lithium Polymer Batteries

Li-poly batteries are also gaining favor in the world of Radio-controlled aircraft as well as Radio-controlled cars where the advantages of both lower weight and greatly increased run times can be sufficient justification for the price. However, lithium polymer-specific chargers are required to avoid fire and explosion.

Fig. 4: Lithium battery

B. Methodology

The design methodology is based on the literature survey which involves the collection of various industrial data, ergonomics, economics and choosing of the proper feasible type with the application of mathematical formulae. The design Methodology is as follows:

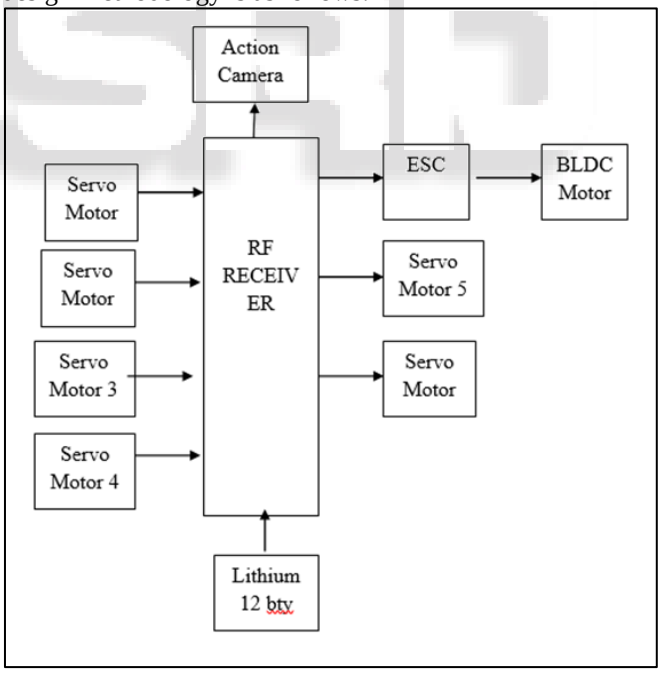

Fig. 5: Block diagram of an RC Controlled plane

1) Deciding the Aircraft's maximum take-off weight:

The maximum takeoff weight (MTOW) or maximum gross takeoff weight (MGTOW) or maximum takeoff mass (MTOM) of an aircraft is the maximum weight at which the pilot is allowed to attempt to take off, due to structural or other limits Some of these requirements can only be met by specifying a maximum weight for the aircraft, and demonstrating that the aircraft can meet the requirement at

all weights up to, and including, the specified maximum. These requirements include:

– Structural requirements – to ensure the aircraft structure is capable of withstanding all the loads likely to be imposed on it during maneuvering by the pilot, and gusts experienced in turbulent atmospheric conditions.
– Performance requirements – to ensure the aircraft is capable of climbing at an adequate gradient. Total weight including payload W = 2 kg.

2) Wings Structure and construction

– Rib Thickness = 2mm
– Rib Spacing = 12.5cm
– Wing Dihedral Angle = 4 degrees
– Materials used for construction
– 2mm Acro plywood.
– 2mm Balsa wood.
– 5mm polonium wood.
– 5mm foam board.
– Heat shrinking plastic for aircraft skin.

3) Software description

– Software Arduino IDE
– Program in "C" embedded system

4) Structure

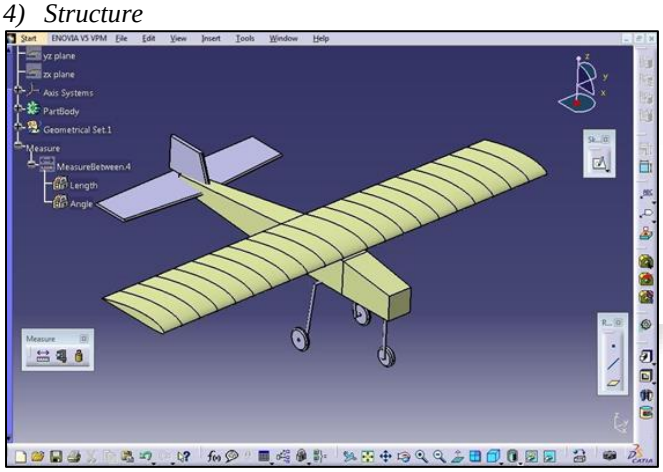

Fig. 6: Model of RC Aircraft

5) Building RF transmitter and receiver

– Install the battery to the 2.4 GHz transmitter, and turn it off.
– Insert the binding plug into the BAT port of the receiver. Connect the ESC to Channel 3, or an external battery (5vdc) to any one of the other channels.
– observing +/- polarity. Power up the receiver using the external battery, or connecting the main battery to the ESC. The LEDs should start to flash.
– Press and hold the lower left button on the transmitter, and then switch on the transmitter's power switch.
– Observe the LED lights on the receivers (main and satellite). Once the LEDs stop flashing, the receiver is bound to the transmitter. It will take about 10 seconds (or less) for the binding process to complete.
– Release the match button on the transmitter. Remove power from the receiver, and turn off the transmitter.
– Remove the receiver binding plug. Connect your servos and other channels as described in.
– Test by turning on the receiver without pressing the match/bind switch. Power the receiver, and the LEDs should light steady meaning it is bound to the transmitter.

If the test failed, repeat this process.

IV. FABRICATION

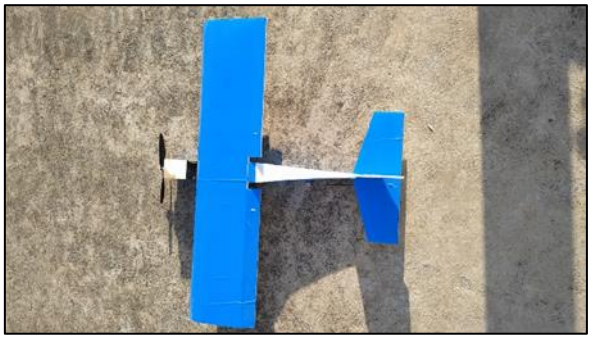

Fig. 7: completed fabricated model

Fig. 8: View of Aileron & Elevator

Fig. 9: Positioning of Servo Motor Controlling the movement of Elevators

Fig. 10: Positioning of Servo Motor Controlling the movement of right Aileron

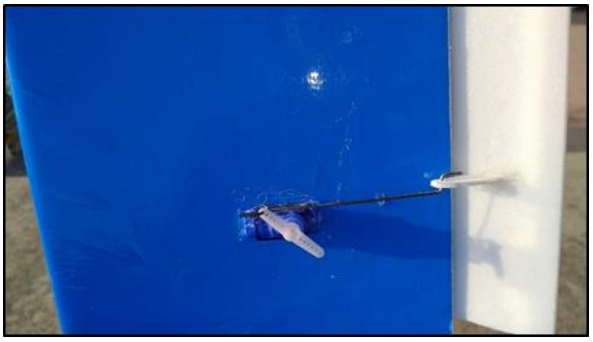

Fig. 11: Connection of Servo motor to Wing of the Aircraft

Fig. 12: Attachment of brushless DC Motor & fan blade

Fig. 13: Addition of extra weight for balancing center of gravity

V. CONCLUSION

- The RC controlled aircraft for surveillance developed is more efficient and robust in nature compared to its contemporaries.
- It can fly across different terrains and varied weather conditions. The biggest advantage is that it is customizable according to the requirement.
- The RC controlled aircraft for surveillance will also be useful to military and civil police, monitor fields with the help of Wi-Fi camera too. To ensure a high-quality product, diagrams and lettering must be either computer-drafted.

VI. FUTURE SCOPE

- Across many different industries, drones represent a whole host of opportunities. Such is the potential of this tech that the market for drones is expected to reach $100 billion in the next five years, with a billion drones predicted to be inhabiting our skies by 2030.
- There are a huge array of companies investigating the possible impact of drones upon their industries, including retail giants like Walmart and Amazon, as well as tech companies like Google.
- Retail: Delivery by drone is one of the most common perceived uses for drones in the future, although some companies are looking to take this concept even further, with Walmart and Amazon warehouse. The large blimp-like UAV proposed by both companies would travel at around 500-1000 feet above ground, launching smaller drones to deliver goods straight to your doorstep.
- Transportation: Drones also represent immense promise in the transport industry too, with this tech predicted to replace around $13 billion worth of human labour and business services by 2020.This is due, in part, to the innovation of flying taxis, with several companies exploring this technology, such as Ehang Corp in China, and Volocopter, who will be trialling two-seater drone taxis in Dubai this year.
- Search and rescue: While drones have only just started to be used in search and rescue missions, so far they have helped to save 59 people from life-threatening situations, according to DJI, the world's leading manufacturer of UAVs. A drone recently saved two swimmers in Australia, and similar 'lifeguard drones' are being trialled in New Zealand, which would help spot surfers in trouble, and come to their aid with floatation devices.
- Agriculture: Drones are already being utilised in the agricultural industry to help monitor vast farmland, analyse soil samples, and even herd cattle. The uses of drones in agriculture could expand even more in the future, with researchers currently working on insect-sized drones in Japan. These tiny drones would be used to pollinate plants, using horse hairs and a sticky ionic gel to move pollen between flowers.

REFERENCES

[1] "Air Force officials announce remotely piloted aircraft pilot training pipeline", www.af.mil, 9 June 2010.
[2] Pir Zubair Shah (18 June 2009). "Pakistan Says U.S. Drone Kills 13". New York Times.
[3] Tice, Brian P. (Spring 1991). "Unmanned Aerial Vehicles – The Force Multiplier of the 1990s". Airpower Journal. Retrieved 6 June 2013.
[4] When used, UAVs should generally perform missions characterized by the three Ds: dull, dirty, and dangerous.
[5] Says, Robert Kanyike. "History of U.S. Drones". Retrieved 17 February 2014.
[6] Boddington, David (2004). Radio-controlled Model Aircraft .Crowood Press.

[7] Example of BNF Planes at Model flight. Archived from the original on 2015-12-08.
[8] Paul K. Johnson (2009-01-21). "Engineering RC Aircraft for Light Weight, Strength & Rigidity". Airfield Models. Retrieved 2012-09-06.
[9] FAI. Archived from the original on 2012-12-29.
[10] UK Radio Control Council - UKRCC - UHF band frequencies". www.ukrcc.org. Retrieved 2017-01-11.
[11] OfW 311 - Radio-controlled models - Ofcom. www.ofcom.org.uk. Retrieved 2017- 01-11.
[12] "FCC Part 97 Amateur Radio Service - Rule 97.215, Telecommand of model craft, section (c)".
[13] RC-Network.de Fernsteuerfrequenzen für den Modellbau - Deutschland (Frequency bands for RC modeling - Germany) - "Am 31.12.2008 endet die Betriebserlaubnis für Fernsteuerungen im Frequenzbereich 433 MHz!" (As of 12/31/2008, RC use of the 433 MHz bands ends in Germany!).

