A Review Paper on Unmanned Aerial Vehicle (U.A.V.)

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Abstract: **Unmanned Aerial Vehicle (UAV) is commonly known as Drone.It is extensively being used these years.Nowdays drones are used in various Military applications, Commercial Cargo Transport, and 3-D Mapping etc. For supporting the weight of the plane, and shock absorption functions, landing gear design is highly needed.Unmanned aerial vehicles (UAV) are the logical successors to modern aircraft and advancements in automated technology. The current generation of UAV's is focused on wartime capabilities and reconnaissance, leaving an existing market untapped by UAV technology: the commercial field. There are thousands of applications for UAV technology in the civilian market, from quick response applications and media outlets to communication technicians and horticulturalists. The vehicle can even act as a path guider in normal case and as a fire extinguisher in emergency.**

1. INTRODUCTION

UAV (unmanned aerial vehicle) also known as drone, is an aircraft without a human pilot on board. Its flight is controlled either autonomously by computers in the vehicle or under the remote control of a pilot on the ground or in another vehicle. UAV has many applications besides the military applications with which "drones" became most associated. Numerous civil aviation uses have been developed, including aerial surveying of crops, acrobatic aerial footage in filmmaking, search and rescue operations, inspecting power lines and pipelines, and counting wildlife, business advertisements etc. A small scale UAV can be designed using EPP foam, brushless motor, servos moter, Electronic Speed Controller (ESC), 2.4 GHz Transmitter and Receiver (Tx/Rx).

The UAV makes use of eleven (delta) mixing which reduces the hardware requirements and complexity in designing the model. The smaller UAV can be used for commercial aerial surveillance, remote sensing, scientific research, etc. There are many applications for UAV technology in the military and civilian market, from emergency response applications and media outlets to communication technicians and horticulturalists. It is a fact, though a very simple fact, that unmanned aerial vehicles (UAVs) are small aircraft, more or less. This means that the UAVs follow the laws of thermodynamics and the laws of physics. UAVs are even more varied in their physical characteristics than are manned aircraft. Their size generally varies with wingspans ranging from 7 inches to 13 ft.Mini- UAVs in the current field have wingspans ranging from 21 inches to 10 ft. These UAVs can be remotely controlled or can fly autonomously based on pre-programmed flight plans. They carry a variety of payloads including infrared cameras, television cameras and jamming electronics. UAVs are of growing importance to military operations, but they can also be used in a variety of civilian applications. Potential military applications for mini-UAVs include local reconnaissance, target identification, post-strike battle damage assessment, electronic warfare (including radar jamming) and combat search and rescue.Civilian applications include monitoring inspection of oil pipelines, traffic, or power-lines, border surveillance, killing harmful insects, surveying wildlife, real estate photography, monitoring concentrations in chemical spills and more.

2. REQUIRED HARDWARE

List of hardware

· 24x36 sheet of 30mm EPP Foam.
· Two Micro Metal Gear 9g servos.
· 2.4 GHz Tx/Rx (Mode 2-Throttle on the left) with delta mixing.
· 40A (ESC) with inbuilt battery eliminator circuit(BEC)
· 2200kV brushless out-runner motor
· 2200mA 3S1P 30C Lithium polymer (LiPo) Battery
· Propeller with diameter 6 inch and pitch 4 inch (6x4).
· Balsa Wood.

3. COMPONENTS DESCRIPTION

3.1 Brushless Out-runner Motor

It is a synchronous motor that is powered by a DC electric source by an integrated switching power supply, which produces an AC electric signal to drive the motors.

3.2 Electronic Speed Controller with Battery Eliminator Circuit

It is an electronic circuit with the objective to vary an electric motor's speed, its direction and possibly also to act as a dynamic brake. The ESCs built in BEC are engineered

so that the current to power the radio system in the UAV is carried from the Li-Po battery (that also powers the brushless motor). This reduces weight as no separate battery is required to be installed to power the radio.

3.3 Lithium Polymer battery

Lithium-ion polymer battery is a rechargeable battery. It usually consists of several identical secondary cells in parallel to increase the discharge current capability, and is frequently available in series configuration to increase the total available voltage.

3.4 Servo

A servo is a type of motor and rotary encoder combination that forms a servo mechanism. The encoder provides position and usually speed feedback, which by the use of a PID controller allow more accurate control of position and thus faster achievement of a position.

3.5 GHz 4 Channel Tx/Rx

It performs the operation of transmitting and receiving communication signals used to control any system. It has a range of 1 kilometer radius and comes with 4 channels which are used to run different components connected to the receiver (eg . servos, speed controller, etc.)

4. SYSTEM DESCRIPTION

4.1 Airframe and Power Plant

A COTS Radio controlled model airplane kit is used for the test platform. The airframe selected for this a Hangar 9, 1/4th scales Piper J3 Cub. The kit is available in Almost Ready-To-Fly condition, an hence minimized setting up time. The scaled down model of a mostly studied general aviation aircraft, such as the Piper Cub, also simplexes dynamic modeling of the platform. The Hangar 9 Piper Cub is provided with individually actuated control surfaces that are used to simulate situations such as aircraft damage and un modeled dynamics such as a change in the moment coincident, Cm0 , due to lowering of both ailerons at the same time, thus acting as apes. These capabilities make the UAV a good test platform for adaptive control research. The power plant chosen for this project is a Fuji Imvac BT43EI gasoline/oil engine.

4.2 Flight Computer

The light computer used is a FitPC2 minicomputer. The FitPC2 is finless Intel Atom based Single board computer. This computer was chosen because of to its light and small form factor and rugged construction. The Intel based architecture facilitate the use of commercially used operating systems such as Windows Embedded and VX Works. The computer has, an HDMI display port, six external USB ports and uses a solid state memory (CF card) for data Storage. This makes the light computer less liable to damage due to vibration. For power supply to the light computer Lithium Polymer batteries are used, capable of delivering a charge of up to 2450 mAh at 14.8 volts. A power board consist of two voltage regulators to step down the voltage from 14.8 volts to 12 volts was built.

4.3 Avionics/Sensor Suite

The UAV uses a Micro strain 3DM-GX3 Attitude Heading Reference System for angular and linear inertial force measurements, orientation. The Micro strain 3DM-GX3 combines a tri-axial gyro, tri-axial accelerometer, tri-axial magnetometer, temperature sensors, and an on-board processor running a delicate sensor fusion algorithm to provide static and dynamic orientation and inertial measurements.

5. USES OF U.A.V.

5.1. Professional aerial surveying

UAS technologies are used all over the world as aerial photogrammetric and LiDAR platforms.

5.2. Commercial and motion picture filmmaking

In the United States, FAA regulations generally permit drone use when they are flown below 400 feet, and within the UAV operator's line of sight.For commercial drone camera work inside the United States, industry sources state that usage is largely at the de facto consent – or benign neglect – of local law enforcement. Use of UAVs for filmmaking is generally easier on large private lots or in rural and exurban areaswith fewer space concerns. In certain localities such as Los Angeles and New York, authorities have actively interceded to shut down drone filmmaking efforts due to concerns driven by safety or terrorism.In the 2014 Winter Olympics in Sochi Drone were used for filming skiing and snowboarding events. Some benefit of using unmanned aerial vehicles in sports are that they allow video to get closer to the athletes, and they are more flexible than cable-suspended camera systems

5.3. Search and rescue

UAVs were used in search and rescue operation after hurricanes struck Louisiana and Texas in 2008. Operating party, between 18,000 and 29,000 feet above sea level, performed search and rescue and damage operation. Payloads carried were an optical sensor and a synthetic aperture radar. The latter can provide images through clouds, rain, fog, and in daytime or nighttime conditions, all in real time. Photos captured before and after the storm are compared, and a computer highlights areas of damage. Micro UAVs, such as the Aeryon Scout, have been used for search and rescue activities on a smaller scale, such as the search for missing persons. UAVs have been tested as airborne lifeguards, locating distressed swimmers using thermal cameras and dropping swimmers.

5.4. Demining

The Space resource for Demining Assistance program from the European Space Agency aims to improve the socioeconomic impact of land release activities in mine action .It is developing and has tested UAV technology for demining in Bosnia-Herzegovina.

5.5. Scientific research

Unmanned aircraft are especially useful in passing through areas that may be too dangerous for manned aircraft. In 2006 the U.S. National Oceanic and Atmospheric Administration began using the Aerosonde unmanned

aircraft system as a hurricane hunter. The 35 pound drone system can fly into a hurricane and communicate near-real-time data directly to the National Hurricane Center. Beyond the standard barometric pressure and temperature data typically choose from manned hurricane hunters, the Aerosonde system provides measurements from closer to the water's surface than previously captured. NASA later began using the Northrop Grumman RQ-4 Global Hawk for e hurricane measurements.

5.6. Applications

· Remote sensing
· Commercial aerial surveillance
· Domestic policing and patrolling
· Forest fire detection
· Transport of goods
· Scientific research
· Oil, gas and mineral exploration and production
Search and rescue operation
· Forest fire detection

6. FUTURE SCOPE

Future work on the autopilot system will include the GPS module for better position data. The GPS and IMU can be fused together using an estimator based approach, to get accurate position data. Future versions of the autopilot will also have the ability to transmit light data to a ground based computer for monitoring and analysis. This will be done by including the 900 MHz radio modem, in the autopilot loop.

7. CONCLUSION

In this paper the procedure to built UAV has been perspicuously stated. The small scale UAV is cost effective and has many applications in various fields like military etc. This brief look at the UCAV and other emerging technologies merely scratched the surface of employing UAVs in a strike role. Further research should focus on control of **CAS** level. Additionally, further study must decide the proper manned unmanned force mix to meet future battle field requirements, as well as doctrinal and the tactical operational considerations for employing UAVs in civil airspace and in concert with Air Expeditionary Forces.

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