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Unmanned Aircraft Vehicle for Surveliance and Research (UAV-SR10)

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***Abstract*— In this paper the development of uninhabited aerial vehicles could potentially revolutionize militaryforce is used in the future. While the early operational experiences with UAVs to provide full range capabilities largely unknown. In this technology enable military forces and aerospacepower more efficiently, which means the lower cost and with less risk to the humans pilot aircraft. In this power mission are best accomplished by uninhabited, piloted and autonomous vehicles with the off-board operators and it's provide the role of pilots and contrast with role of remotely piloted autonomous vehicles. In this assumption of remotely pilotand the autonomous vehicles are used for the military operation as well as researching purposes. It's essential for defense establishment to consider the strategic and technological of these aerial vehicles are used for the new generation of aerial vehicles.**

***Index Terms*—About four key words or phrases in alphabetical order, separated by commas.**

I. Introduction

A lot of research is conducted in the field of solar powered vehicle and aircrafts, culminating in competitions such as the 2007 World Solar Challenge to be held in Australia latter this year. Electric powered aircraft is not a new concept and has been around a number of years. Solar powered flight for high altitude long endurance aircraft such as HELIOS has recently been demonstrated. For the smaller scale HALE UAVs, design aspects were reported by Colza. Solar powered aero model are potentially better suited for performing these Dull, Dirty, Dangerous aerial network. Due to the low altitude long endurance capability of these Unmanned solar powered aero model. The aircraft fuselage and propulsion system are major design factors. Aircraft work with battery powered by solar cells with an efficient energy store offers a very attractive propulsion method. The main advantage of utilizing a solar powered electrical propulsion system, above the conventional combustion type, is its potential to sustain flight without the need to carry excessive fuel loads. Electric propulsion systems also do not suffer from unwanted exhaust an emission that is detrimental in atmospheric sensing applications. An aircraft capable of sustained flight, propelled by a zero emission renewable energy source, is a very attractive aerial platform. Solar powered aero model is ability to fly for extended periods of time has long been a challenge for the aeronautical fraternity. These solar powered aircraft would provide an ideal platform for a host of potential users. Missions or such an aircraft would mainly be focused on aircraft get powered by solar power (non- renewable energy source). Applications include aerial photography and remote sensing. Surveillance applications entail civilian or military reconnaissance, border patrols and services utility patrols such as the monitoring of pipelines or power lines. Many of these applications however fall into the category of dull, dirty or dangerous aerie the high level design requirement was to: "Design and build a small scale solar powered aerial vehicle capable of demonstrating sustained flight. The following sections present the design considerations for a small scale solar powered LALE UAV. Its primary intent is to provide insight into the critical design aspects of small scale solar powered UAVs for LALE applications like aerial photography and remote sensing at work with its associated risks and cost.

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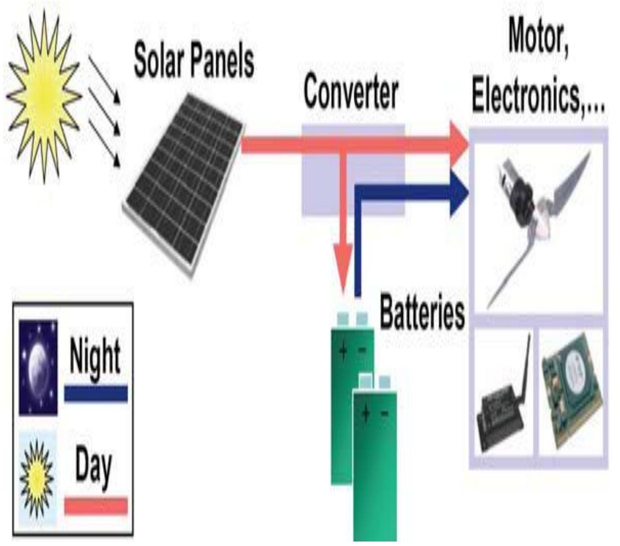
II. LITERATURE REVIEW

In this paper investigates controller design and using multi objective genetic programming for a multi-robot system to solve a highly constrained problem. The Unmanned aerial Vehicles (UAV) must monitor the targets spreads through the large area and UAV communicate with small range and UAV based on sensor information and communication and the results suggest that the results evolves effective controllers if the communication is limited to the nearest UAV. The most research robots do not require any assurance prior to the operation that evolved controller will not damage the vehicle. We have to perform a series of robustness tests. The results show that our best evolved controller outperforms twohand-designed controllers and is robust to many sources of noise. In this study realistic flight parameters and sensor inputs are selected to aid in the transference controllers of physical UAVs. In the next stage of research, the best evolved controller will be tested by using them to fly real UAVs.

III. SUNSAILOR-SOLAR POWERED UAV

A solar cell (or a "photovoltaic" cell) is a device that converts photons from the sun (solar light) into electricity. In general, a solar cell that includes the capacity to capture both solar and non-solar sources of light (such as photons from incandescent bulbs) is termed a photovoltaic cell. Fundamentally, the device needs to fulfill only two functions: photo generation of charge carriers (electrons and holes) in a light-absorbing material, and separation of the charge carriers to a conductive contact that will transmit the electricity. This conversion is called the photovoltaic effect, and the field of research related to solar cells is known as photovoltaic.Solar panels cover a certain surface of wing or other part of the airplane (tail, fuselage…). During the day, depending on the sun irradiance and the inclination of the rays, the convert light into electrical energy. During the night, as no more power comes from the solar panels, only the battery supplies the various elements. This is schematically represented on the figure below.



IV. LITHIUM-POLYMER BATTERIES (LI-PO)

A battery is a device in which chemical energy is directly converted to electrical energy. It consists of one or more voltaic cells, each of which is composed of two half cells connected in series by the conductive electrolyte.Consists of one or more voltaic cells in series or parallel. Li-Po batteries are pretty much the latest battery widely accepted for R/C application. They tend to be much lighter weight than the nickel based batteries for a given capacity. They now are available in many different capacities, but have had a troublesome reputation for catching fire, mainly due to mishandling or physical damage. They have a nominal voltage of 3.7 Voltage Per Cells, with a maximum safe voltage of 4.2 Voltage Per Cells. The minimum voltage during discharge is between 2.5 Voltage per Cells and 3.0 Voltage per Cells, depending on the manufacturer or to whom you listen. Certainly, a minimum 2.9 or 3.0V is conservative. The problem with Li-Po's is that if they are discharged to below the minimum voltage per cell, they may be ruined. Because Li-Po's are very sensitive to minimum and especially maximum voltage, it is almost universally agreed that it is important to keep the cells of a Li-Po battery well balanced to avoid over-charging any cell. Li-Po batteries must be charged with a charger designed for Li-Po cells. If one grossly overcharges a Li-Po cell using the wrong type of charger, it is likely to swell up, and if overcharged enough, it will probably rupture and catch fire (due to the exposure of Lithium metal to air/moisture). Li-Po batteries must be charged by CC/CV (constant current/constant voltage) combination charge at the 1C rate maximum. When the charge begins, the charger supplies 1C current to the battery until the voltage reaches 4.2 Volts per cell. At this point, the charger switches to constant voltage (4.2V) with the current decreasing until it reaches about 5% of the original charge rate.This is usually considered a full charge. Charging at the 1C rate, most Li-Po's will reach full charge from discharged in less than 2 hours. Most good Li-Po batteries are now capable of discharge rates of at least 15C, with many capable of 20C or more without damage. However, experience is showing that operating near the published discharge current limits shortens the life of the battery.

Specifications:

(1).Input Voltage：DC11.5~13.5V

(2).Input Current1500 mAh

(3).Single battery full 0.05V

(4).Minimum chargeable battery voltage: 1.25V (the charger will indicate that there no battery if single cell voltage lower than this parameter)

(5).The restoration time of defective battery: 3 MIN (If restoration still cannot be finished when overtime, indicate that the battery has been damaged

(6).Compatible chargeable battery: 11.1V 1000mAh；7.4V 800mAh Li-Polymer battery

(7).Final Voltage: 8.4 ±0.1V 2 cells; 12.6V ±0.1V 3cells

A. Electronic Speed Controller

An electronic speed control or ESC is an electronic circuit with the purpose to vary an electric motor's speed, its direction and possibly also to act as a dynamic brake. ESCs are often used on electrically-powered radio controlled models. An ESC can be a stand-alone unit which plugs into the receiver's throttle control channel or incorporated into the receiver itself, as is the case in most R/C vehicles. Some R/C manufacturers that install proprietary electronics in their air level vehicles, vessels or aircraft use onboard electronics that combine the two on a single circuit board. The electronic speed control for brushless motors is designed to offer durable power and efficiency. It uses trouble-free sensor less technology and features lightweight design & compact size without needing additional condensers or capacitors. It is easy to install, user friendly and comes with pre-installed high power connectors. It also features automatic cut-off, automatic neutral setting, automatic battery type detection, automatic high temperature protection and fail safe mode

-Input voltage: 7.2V (Ni-Cad & Ni-MH) – 7.4V ~ 11.1V (Li-Po).

Output Power IC Spec: 54A at 25°C – 45A at 100°C – 300 Watt

B. Brushless DC Motor

In a typical brushless motor the electromagnetic field, created by permanent magnets, is the rotating member of the motor and is called a rotor. The rotating magnetic field is generated with a number of electromagnets commutated with electronics switches (typically transistors or FETs) in a right order at right speed. In a brushless motor, the trick becomes to know when to switch the electrical energy in the windings to perpetuate the rotating motion. This is typically accomplished in a brushless-type motor by some feedback means designed to provide an indication of the position of the magnet poles on the rotor relative to the windings. A brushless motor is often used when high reliability, long life and high speeds are required. The bearings in a brushless motor usually become the only parts to wear out. In applications where high speeds are required (usually above 30,000 RPM) a brushless motor is considered a better choice (because as motor speed increases so does the wear of the brushes on traditional motors). A brushless motor's commutation control can easily be separated and integrated into other required electronics, thereby improving the effective power-to-weight and/or power-to-volume ratio. BLDC motors can be constructed in several different physical configurations In the conventional or in runner configuration. The permanent magnets are part of the rotor. Three stator windings surround the rotor. In the out runner configuration, the radial-relationship between the coils and magnets is reversed.The stator coils form the center (core) of the motor, while the permanent magnets spin within an overhanging rotor which surrounds the core.The flat type, used where there are space or shape limitations, uses stator and rotor plates, mounted face to face. Out runners typically have more poles, set up in triplets to maintain the three groups of windings, and have a higher torque at low RPMs. In all BLDC motors, the coils are station BLDC motors can be constructed in several different physical configurations In the conventional or in runner configuration. The permanent magnets are part of the rotor. Three stator windings surround therotor. In the out runner configuration, the radial-relationship between the coils and magnets is reversed. The stator coils form the center (core) of the motor, while the permanent magnets spin within an overhanging rotor which surrounds the core. The flat type, used where there are space or shape limitations, uses The fuselage is the main structure or body of the aircraft to which all other units attach. It provides spare for the crew, passengers, cargo, most of the accessories, and other equipment. Fuselages of naval aircraft have much in common from the standpoint of construction and design. They vary mainly in size and arrangement of the different compartments. Designs vary with the manufacturer sand the requirements for the types of service the aircraft must perform. The fuselages of most naval aircraft are of all-metal construction assembled in a modification of themonologue design. The monologue design relies largely on the strength of the skin or shell (covering) to carry the various loads. This design may be divided into three classes' monologue, semi monologue, and longitudinal members, that is, stringers and longer but has no diagonal web members. The reinforced shell has the shell reinforced by a complete framework of structural members. The cross sectional shape is derived from bulkheads, station webs, and rings. The longitudinal contour is developed with longer, formers, and stringers. The skin (covering) which is fastened to all these members carries primarily the shear load and ,together with the longitudinal members, the load softension and bending stresses. Station webs are built up assemblies located at intervals to carry concentrated loads and at points where fittings are used to attach external parts such as wings alighting gear, and engine mounts. Formers and stringers may be single pieces of built-up sections. Various points on the fuselage are heated by station number. Station 0 (zero) is usually located at or near the nose of the aircraft. The other fuselage stations (FS) are located at distances measured in inches aft of station 0.Quick access to the accessories and other equipment carried in the fuselage is through numerous doors, inspection panels, wheel wells, and other openings. Servicing diagrams showing the arrangement of equipment and the location of access doors are supplied by the manufacturer in the maintenance instruction manuals and maintenance requirement cards for each model or type of aircraft.

V. FUSELAGE

The fuselage is the main structure or body of the aircraft to which all other units attach. The fuselage is the main structure or body of the aircraft to which all other units attach. t provides spare for the crew, passengers, cargo, most of the accessories, and other equipment. Fuselages of naval aircraft have much in common from the standpoint of construction and design. They vary mainly in size and arrangement of the different compartments. Designs vary with the manufacturers and the requirements for the types of service the aircraft must perform. The fuselages of most naval aircraft are of all-metal construction assembled in a modification of themonocoque design. The monocoque design relies largely on the strength of the skin or shell (covering) to carry the various loads. This design may be divided into three classes' monocoque, semimonocoque, and longitudinal members, that is, stringers and longerons, but has no diagonal web members. The reinforced shell has the shell reinforced by a complete framework of structural members. The cross sectional shape is derived from bulkheads, station webs, and rings. The longitudinal contour is developed with longerons, formers and stringers. The skin (covering) which is fastened to all these members carries primarily the shear load and, together with the longitudinal members, the loads oftension and bending. Station webs are built up assemblies located at intervals to carry concentrated loads and at points where fittings are used to attachexternal parts such as wings alighting gear, and engine mounts. Formers and stringers may be single pieces of built-up sections. There are many advantages in the use of these mimonocoque fuselage. The bulkheads, frames, stringers, and longerons aid in the construction of astreamlined fuselage. They also add to the strength andrigidity of the structure. The main advantage of thisdesign is that it does not depend only on a few members for strength and rigidity. All structural members aid inthe strength of the fuselage. This means that as emimonocoque fuselage may withstand considerable damage and still remain strong enough to hold together. On fighters and other small aircraft, fuselages are usually constructed in two or more sections. Larger aircraft may be constructed in as many as six sections. Various points on the fuselage are heated by station number. Station 0 (zero) is usually located at or near the nose of the aircraft. The other fuselage stations (FS) are located at distances measured in inches aft of station. Quick access to the accessories and other equipment carried in the fuselage is through numerous doors, inspection panels, wheel wells, and other openings. Servicing diagrams showing the arrangement of equipment and the location of access doors are supplied by the manufacturer in the maintenance instruction manuals and maintenance requirement cards for each model or type of aircraft.

A. Elevator

Elevators are control surfaces, usually at the rear of an aircraft, which control the aircraft's orientation by changing the pitch of the aircraft, and so also the angle of attack of the wing. In simplified terms, they make the aircraft nose-up or nose-down. (Ascending and descending are more a function of the wing aircraft typically land nose up.) An increased wing angle of attack will cause a greater lift to be produced by the profile of the wing, and a slowing of the aircraft speed. A decrease in angle of attack will produce an increase in speed. The elevators may be the only pitch control surface present (and are then called a stabilator), or may be hinged to a fixed or adjustable surface called a stabilizer .The rear wings to which elevators are attached have the opposite effect to a wing. They usually create a downward pressure which counters the unbalanced moment due to the airplane's center of gravity not being located exactly on the resulting center of pressure, which in addition to the lift generated by the main wing includes the effects of drag and engine thrust. An elevator decreases or increases the downward force created by the rear wing. An increased downward force, produced by up elevator, forces the tail down and the nose up so the aircraft speed is reduced (i.e. the wing will operate at a higher angle of attack, which produces a greater lift coefficient, so that the required lift is produced by a lower speed). A decreased downward force at the tail, produced by down elevator, allows the tail to rise and the nose to lower. The resulting lower wing angle of attack provides a lower lift coefficient, so the craft must move faster (either by adding power or going into a descent) to produce the required lift. The setting of the elevator thus determines the airplane's trim speed - a given elevator position has only one speed at which the aircraft will maintain a constant (accelerated) condition. In some aircraft pitch-control surfaces are in the front, ahead of the wing; this type of configuration is called a canard, the French word for duck. The Wright Brothers' early aircraft were of this type.

B. Wings

The wings of an aircraft are designed to develop lift when they are moved through the air. The particular wing design depends upon many factors for example, size, weight, use of the aircraft, desired landing speed,and desired rate of climb. In some aircraft, the larger compartments of the wings are used as fuel tanks. The wings are designated as right and left, corresponding to the right- and left-hand sides of a pilot seated in the aircraft. The wing structures of most naval aircraft are of an all-metal construction, usually of the cantilever design; that is, no external bracing is required. Usually wings are of the stress-skin type. This means that the skin is part of the basic wing structure and carries part of theloads and stresses. The internal structure is made of spars and stringers running span wise, and ribs and formers running code wise (leading edge to trailing edge). The spars are the main structural members of the wing, and are often referred to as beams .One method of wing construction In illustration, two main spars are used with ribs placed at frequent intervals between the spars to develop the wing contour. This is called two-spar construction. Other variations of wing construction include monocarp (open spar), multipart (three or more spars),and box beam. In the box beam construction, the stringers and spar like sections are joined together in a box-shaped beam. Then the remainder of the wing is constructed around the box. The skin is attached to all the structural members and carries part of the wing loads and stresses. During flight, the loads imposed on the wing structure act primarily on the skin. From the skin, the loads are transmitted to the ribs and then to the spars. The spars support all distributed loads as well concentrated weights, such as a fuselage, landing gear, and nacelle. Corrugated sheet aluminum alloy is often used as a sub covering for wing structures. The Lockheed P-3Orion wing is an example of this type of construction.

VI. CONCLUSION

In this project we have proposed the aircraft powered by solar. Also, we also implemented in this design of an aircraft by using consumer parts (Balsa wood,). Aircraft is controlled by remote controlled. Results of this study showed the impact of power system component performance and mission conditions on UAV aircraft size. The most significant reduction in aircraft size was found to occur by increasing the energy storage (fuel cells in this case) specific energy, whereas the effects of PV module and power electronics efficiency and mass play a marginal role in comparison. Flight altitude, flight latitude, time of year, and payload mass also play significant roles in determining aircraft size. It was found that an energy storage specific energy of 250- 500 Whr/kg is required to enable most useful missions, and that operation in the winter at northern latitudes may not be possible. Also, it is concluded that PV cells with AM0 efficiencies greater than - 12%, possibly even thin-film PV cells, are suitable for solar-powered UAV use.

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