FINAL YEAR PROJECT REPORT

Design and fabrication of solar powered plane (UAV) Shams one

A PROJECT REPORT

Submitted by:

Abdul Mateen Jamil : 12017019046
Syed Muhammad Junaid Javaid : 12017019138
Taha Nadeem Baig : 081220216
Rana Qamar Zaman: 101519163

Supervised by:
Mr. Jameel Ahmad
Director Undergraduate Studies

Department of Electrical Engineering
School of Engineering
University of Management and Technology Lahore

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DESIGN AND FABRICATION OF SOLAR POWERED PLANE (UAV) SHAMS ONE

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Declaration

All the work that is the part of this thesis is done by us, otherwise it is mentioned, and it is not used somewhere in academics, business or industry to get any qualification.

Signed by:
Abdul Mateen Jamil: _____
Syed Muhammad junaid javaid: _____
Taha Nadeem baig: _____
Rana Qamar zaman: _____

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Abstract

Energy is the most valuable resource and foundation of civilization. It is also our heritage for future generations. Preserving this resource will boost technology. Solutions that previously seemed impossible or too expensive, today, are technically and economically achievable. Application of new capacity generated by renewable energy sources can make a machine workable for long time.

Solar energy is most charming sources of energy as it is have no price. Solar energy, on the other hand can be important because this energy is infinite. The solar energy received by earth in one hour is more than world's annual energy consumption. World attention to solar energy has risen. Solar radiations are converted to electrical energy with the usage of solar cells although this electrical energy varies in power with the respect of radiations absorbed by a solar cells array. The plane is built by keeping in mind that it has to carry (400) grams of pay load and still it should not disturb aerodynamics of plane for this purpose we designed a plane with (120) inch wingspan in light weight balsa wood and reinforced with carbon fiber and fiber glass to make sure that wings do not feel too much flex during flight controls. Network synchronization issues areexamined and a suitable voltage regulation plan is proposed. Two arrays of solar cells was paste on top of the wings to get the desire voltage and current from the solar cells. This electrical energy shift in switch compartment of fuselage where a flight controller decides to transfer this energy in DC to DC booster or in solar ESC by servo switches which is controlled by receiver signals of plane. The solar ESC is configure and programmed according to the power requirement. Network synchronization issues are examined and a suitable voltage regulation plan is proposed. On the other hand (94.5%) efficient booster produce enough voltage for (MPPT) solar charge controller to charge a (22.2) volt (4) amps battery. To avoid sparking or over heating silicone wires used in fuselage with heat shrinks covered on each joints. The (MPPT) solar charge controller has features to charge battery, prevent overcharge, high speed power tracking, and temperature sensor to avoid overheating. The battery is li ion with (25 C) discharge rate capacity which can provide burst current when needed. (360) kva (22.2) volt brushless AC motor with (24) poles used to rotate (17) inch carbon fiber prop with (7.5) pitch and (6000) rpm to get desired thrust. (80) Amps (26) volt ESC is chosen to drive this power train for maximum power during landing and takeoff. The ESC is programmed for rpm, timing mode, system voltage cut off and throttle calibration to fly for longer duration of time. DC is transformed into AC for AC motor and it has built in (BEC) to power on receiver on 5 volt. Six channel RC receiver is

attached with servo switches and servo motors to control radar and elevators of plane. To full fill the demand of area for solar cells and stability of plane stabilizer was built with solid (6*24 ½) inch balsa sheet.

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Introduction

A solar plane could go on to revolutionize solar technology in aviation. The NASA Pathfinder Solar plane had already proven solar planes were possible. Solar cells generate electricity from sun radiations. Sunlight based cells are delegated to begin with, second and third era cells. The original cells are generally manufactured from semiconductor materials as Silicon wafers and come as single or poly crystalline silicon. Second era cells are slim film sun oriented cells including indistinct silicon, Copper indium gallium selenite etc. These cells are prevalently utilized as a part of business PV power producing frameworks, building coordinated PV (BIPV), remain solitary and matrix joined PV frameworks. Third era is new innovation and cells are built from natural or inorganic materials. Mono crystal line solar cells used to get max efficiency. So with these solar cells we were able to succeed in our plan by getting desired power ratio. Solar powered planes are able to fly for longer period of time keeping this idea in mind we designed a plane which will behave stable during flight. This plane has capacity to charge during flight. (22) Solar cells of (3.75) watt and (22) solar cells of (1.25) watt produce enough power to charge batteries. This plane has ability to switch from battery to solar power during flight to charge batteries and to fly with direct solar power (full sunny day). MPPT solar charge controller track for maximum power point after every second which helps to charge batteries in shorter period of time during flight. Just 1300 grams of thrust is needed for stable flight which is provided by solar cells electrical power for direct solar powered flight. Aerodynamics of plane was designed according to minimize the drag forces and maximize the lift. The fuselage is built so that it can carry more electronic parts and batteries. The wing of the plane is designed for maximum lift at slow speed. The average speed of the plane is about 60 km/h.