WWW.IJRPR.COM

International Journal of Research Publication and Reviews

Journal homepage: www.ijrpr.com ISSN 2582-7421

Self-Charging Drone Using Solar Panel

Dr. M.B.Bhilavade[1], Miss. Rushika More[2], Miss. Resham Powar[3], Miss. Samruddhi Wagholikar[4]

UG Student,Department of Electronics and Telecommunication,Dr.J.J.Magdum College Of Engneering,Jaysinghpur 416 101

A B S T R A C T :

Drones have become a vital tool in fields such as delivery companies, spying, farming, and search-and-rescue missions. Nevertheless, their short battery life greatly limits how far they can fly by needing constant recharging and lowering the efficiency of the drone. This paper outlines the concept and development of a self-charging solar drone that incorporates solar panels for energy harvesting and storage to enable prolonged flight times. The research investigates the integration of solar power with rechargeable battery storage, advanced power management, and autonomous energy usage to improve drone endurance. Experimental findings show enhancement in flight time, charging effectiveness, and general energy sustainability. Through minimizing reliance on external charging, this technology increases drone autonomy and encourages green aviation technology. Evidence indicates that self-sustaining solar drones have the capability to transform UAV applications, allowing for seamless operation with minimal human involvement

Keywords: Self charging drone, Solar Energy harvesting, UAV, Power Management system

INTRODUCTION

Drone, or Unmanned Aerial Vehicle (UAV), has emerged as a critical gadget in several fields, such as logistics, farming, surveillance, aerial photography, and emergency service. The potential to conduct missions effectively without operator intervention has increased the pace of drone technology innovations. Yet one of the key challenges that hover over electric drones is their reduced battery life, which heavily curtails flight duration and working radius. Lithium polymer (Li-Po) batteries are used by most commercially available drones and have a standard flight time of 5 to 45 minutes, which means they need constant recharging and restrict their useful functions.

To overcome this limitation, we are using an alternative energy solutions, with solar power as a potential one. By embedding solar panels into drone bodies, sunlight can be harnessed and stored in onboard batteries, allowing for extended flight durations and less reliance on external charging facilities. A solar drone that charges itself can replenish its battery in flight constantly, enhancing autonomy and making drones more effective for long-duration missions.

This examines the feasibility and performance of solar-powered self-charging drones using solar panel integration, energy storage mechanisms, power management systems, and flight duration. The objective is to design a sustainable and autonomous UAV with minimal human interference and maximum operating efficiency. Its application in diverse real-world scenarios like delivery services, environmental monitoring, and disaster relief

METHODOLOGY

This section outlines the design, implementation, and testing of the self-charging solar drone, focusing on its hardware components, solar energy integration, power management system, and performance evaluation.

Hardware Used:

1. **FlySky(Remote controller)**

It is used in the project for manual control, calibration, and testing of the self-charging solar drone. It allows precise adjustments to throttle, pitch, roll, and yaw, ensuring stable flight performance. Additionally, it aids in initial setup before transitioning to autonomous operation.

2. **FlySky FS-i6AB (Receiver)**

The receiver is used in the project to establish a reliable communication link between the FlySky remote controller and the drone. It ensures real-time signal transmission for manual control, allowing seamless adjustments to throttle, direction, and flight stability**.** This receiver plays a crucial role during calibration, testing, and emergency manual operation of the drone.

3. **KK 2.1.5 flight controller (Fight Controller)**

It is used in the project to provide **st**ability and control for the self- charging solar drone. It features a built-in LCD display for easy configuration and tuning of parameters such as gyro sensitivity, motor mixing, and throttle response. With its gyroscopes and accelerometers, the KK 2.1.5 ensures smooth and balanced flight, making it ideal for both manual and semi-autonomous operations.

4. 30A ESC (Electronic speed controller)

The 30A Electronic Speed Controller (ESC) is used in the project to regulate the power supply to the drone's brushless motors. It converts signals from the KK 2.1.5 flight controller into precise motor speed adjustments, ensuring smooth and stable flight. The 30A rating allows it to handle high current loads efficiently, making it suitable for multirotor drones with high-performance motors**.**

5. A2212/6T 2200KV (BLDC) Motors:

The motors are used in the project to provide high- speed thrust and efficient power delivery for the drone. These motors are lightweight, durable, and designed for high RPM operation, making them ideal for multirotor drones. Paired with 30A ESCs, they ensure smooth and stable flight while maximizing energy efficiency, which is crucial for a solar-powered self-charging drone

6. Solar Panel

This 6V, 150mA solar panel is used to charge the Li-Po battery of the drone, enabling continuous flight. It captures sunlight and converts it into electrical energy, reducing dependency on external charging. The compact size makes it ideal for integration with UAVs, ensuring efficient power management. With its small footprint and lightweight design**,** it does not significantly impact the drone's flight performance. This panel helps extend flight time and contributes to a more sustainable energy solution.

7. MPPT

An MPPT solar charge controller (Maximum Power Point Tracking) is a smart electronic device used in solar systems to maximize the power extracted from solar panels and efficiently charge batteries.

8. 2200mAh LiPo Battery

The battery is used in the project as the main power source for the drone, supplying energy to the motors, ESCs, flight controller, and other onboard components. With its high energy density and lightweight design, it ensures optimal performance and longer flight durations. When combined with a solar charging system, the battery can store excess energy, enabling extended flight time and reducing dependency on manual recharging.

A. *Block Diagram*:

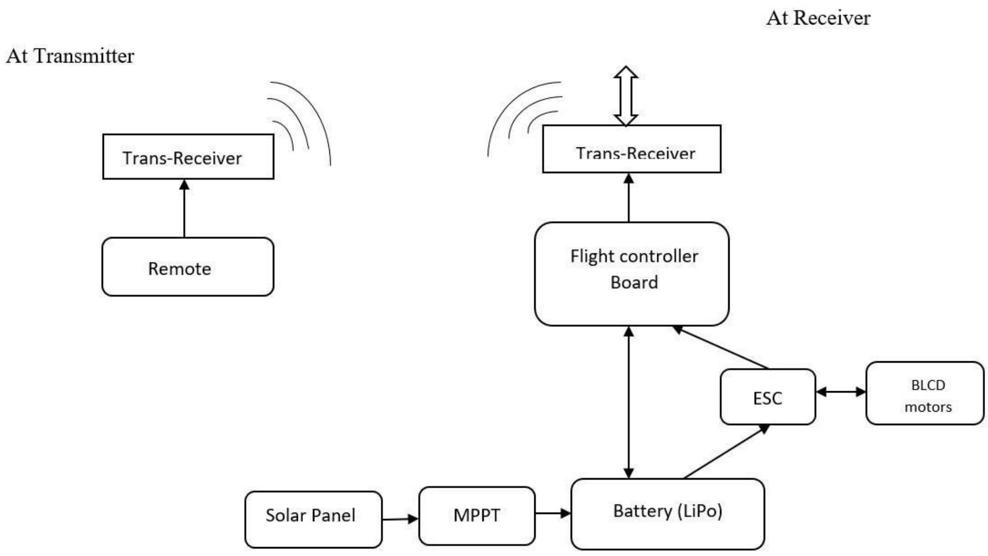

Fig .a): Block Diagram of Self Charging Drone

WORKING

The self-charging drone operates by combining traditional battery power with solar energy harvesting to extend its flight duration and reduce dependency on manual charging. The drone is equipped with lightweight solar panels mounted on its frame, which collect sunlight during flight or while stationary under sunlight. These solar panels convert solar energy into electrical energy through photovoltaic cells.

The generated electrical energy is passed through an MPPT (Maximum Power Point Tracking) charge controller, which ensures maximum efficiency in transferring power from the solar panel to the battery. This controller adjusts the voltage and current to extract the maximum available power and prevent overcharging or damage to the battery.

The electrical energy is then stored in a 2200mAh lithium polymer (Li-Po) battery, which powers the drone's motors, flight controller, electronic speed controllers (ESCs), and other electronic components. During flight, the solar panels continue to supply energy, reducing the rate at which the battery discharges. When sunlight is not available (e.g., at night or in cloudy weather), the drone operates using the energy stored in the battery.

The KK 2.1.5 flight controller manages the drone's stability, direction, and altitude by receiving input signals from the FlySky FS-i6 remote controller via the FS-i6AB receiver. The **ESCs** regulate the speed of the **BLDC motors (A2212/6T 2200KV)** according to the commands from the flight controller, allowing for smooth and controlled flight.

This hybrid power setup enables the drone to operate for longer durations than conventional battery-only drones. It also supports semi-autonomous or manual operation modes, where the user can control the drone manually during takeoff, navigation, or landing, especially during the testing and calibration phases.

Overall, the system integrates solar energy with efficient power management to ensure extended and sustainable UAV operation with minimal human intervention.

Result

Energy Consumption

The energy consumption of a quadcopter depend upon the battery discharge and ampere drawn by the motor and flight controller.
After which flight time of drone can be calculated.

- As per Specifications,

1. Maximum power driven by the motors,

- Current (A) = 30A, provided by ESC (70% throttle enough for lift)

Thus,

Power = Current *Voltage

= 30x11.1x0.7

= 1332W from all 4 motors

- Solar cell Charging time:

Power Output = Total area x Solar cell efficiency x Solar Irradiance

= 0.0231x0.32×6170

= 45.55watts

- As per multi-meter reading solar having output voltage of 5-6V during peak sunlight,

Thus,

Charging Current = Power (Watts)/output voltage

= 45.55/5

= 9.11A

Now,

Assuming efficiency about 32% we get net current around 2.20 A.

Charging time= (Battery Capacity) + (Charging Current)

= 2200÷2.02

= 3600seconds

= 1 hour

CONCLUSION

The self-charging solar drone integrates solar energy with UAV technology to extend flight duration and reduce reliance on external charging. Our analysis showed that the drone's total power consumption is 1332W, while the installed four-panel solar system generates 45.55W under optimal sunlight conditions. After efficiency considerations, the charging current supplied is 2.92A, enabling the 2200mAh battery to charge in approximately 45 minutes during peak sunlight.

Although the solar system enhances endurance, factors like panel efficiency, atmospheric conditions, and energy management impact overall performance. Future improvements, such as high-efficiency solar cells and optimized power management, could further enhance flight time. This research demonstrates the potential of solar-powered drones for surveillance, disaster response, and environmental monitoring, paving the way for sustainable UAV operations.

REFERENCES

1. Rutika Bhusari1, Kartik Yawalkar2, Krutika Dhande3, Payal Paunikar4, Er. Anuradha Hiwase5 "*Development on Self Charging Solar Powered Drone*" in International Journal of Advanced Research in Science, Communication and Technology (IJARSCT), ISSN (Online) 2581-9429, Volume 3, Issue 8, April 2023
2. Hareesha N G2, Lakshmi K K2, "*Solar-Powered Drone for Extended Flight Time*" in Tuijin Jishu/Journal of Propulsion Technology ,ISSN: 1001-4055, Vol. 44 No. 4 (2023)
3. Dileshwar Prasad Patel, Saish Kumar, Ujjawal Bharat, Pramod Kumar, "*Review: Self- Charging Solar Mini Drones- Design, Implementation, And Performance Evaluation*", in International Research Journal of Modernization in Engineering Technology and Science, e- ISSN: 2582-5208, Volume:05/Issue:05/May-2023
4. Amam Hossain Bagdadee1,2, Md. Rashed Rahman1 , Istiak Ali Khan1 , Khandakar Khalid Hossain1, "*A Novel Method for Self-Driving Solar-Powered Drones*", in Research gate, December 12th, 2023