

SOLAR ASSISTED AIRCRAFT AUXILLARY POWER UNIT

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Abstract

The aviation industry is continuously exploring ways to reduce fuel consumption and environmental impact without compromising performance. This paper presents a Solar Assisted Auxiliary Power Unit (APU) designed to support aircraft electrical systems using renewable energy. The proposed system integrates lightweight, thin-film photovoltaic panels on the aircraft fuselage to generate supplementary power during ground and limited flight operations. Unlike conventional approaches, the design avoids wing integration to prevent aerodynamic disturbances, ensuring minimal impact on aircraft stability and performance. The generated energy is stored in onboard batteries and utilized to assist the APU, thereby reducing fuel dependency and emissions. The study highlights the feasibility of combining solar energy with existing aircraft systems as a step toward more sustainable and efficient aviation.

Key Words: Solar Assisted APU, Aircraft Power System, Photovoltaic Panels, Sustainable Aviation, Energy Storage.

1.INTRODUCTION

The aviation industry is increasingly focusing on reducing fuel consumption and environmental impact while maintaining efficiency. Conventional aircraft rely on Auxiliary Power Units (APUs) to provide electrical and pneumatic power, which consume fuel even during ground operations. To address this issue, this study introduces a Solar Assisted APU system that utilizes thin-film photovoltaic panels to generate supplementary electrical power.

The solar panels are integrated onto the aircraft fuselage to avoid aerodynamic disturbances that may occur with wing placement. The generated energy is stored in batteries and used to support the APU, reducing fuel dependency and emissions. This approach offers a simple and effective step toward more sustainable and energy-efficient aircraft systems.

2. Body of Paper

The proposed Solar Assisted APU system consists of thin-film photovoltaic panels, an energy storage unit, a charge controller, and a power management system. The solar panels are mounted on the aircraft fuselage to capture solar energy without disturbing aerodynamic performance. The generated electrical energy is regulated and stored in onboard batteries for later use.

During operation, the stored energy supports the Auxiliary Power Unit by supplying part of the electrical load required for aircraft systems. This reduces the dependency on fuel-based power generation, especially during ground operations. The placement of panels on the fuselage ensures minimal drag impact, and any slight change in the center of gravity can be managed through proper load balancing.

Overall, the system improves fuel efficiency, reduces emissions, and enhances the sustainability of aircraft operations without compromising performance.

BLOCK DIAGRAM – SOLAR ASSISTED APU SYSTEM

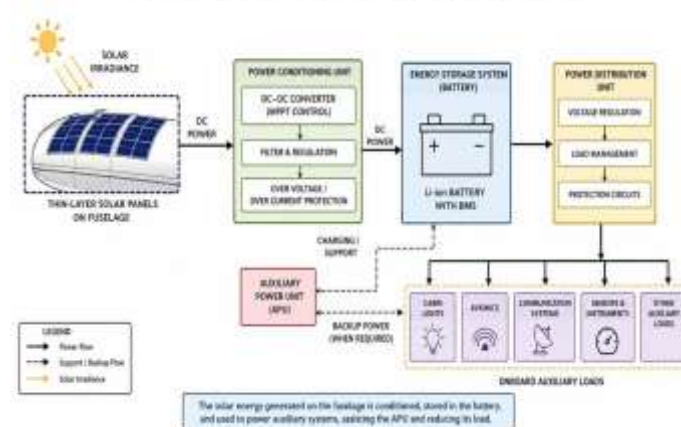


Fig 1.1



Fig 1.2

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Table 1: Components of Solar Assisted APU System

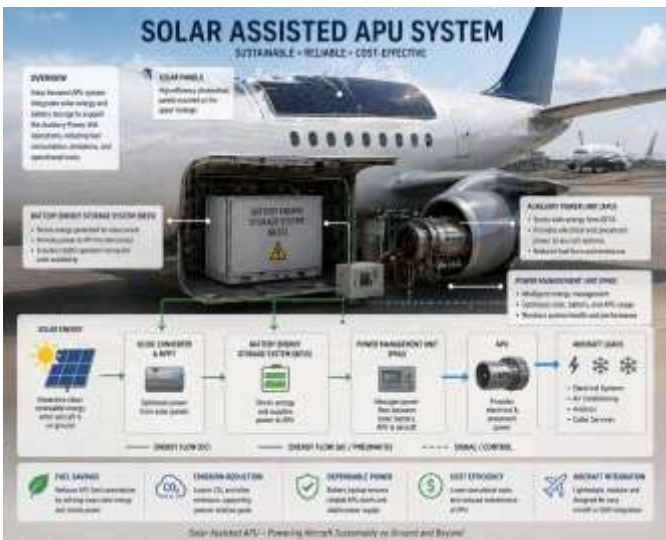


Fig 1.3

Table -1: Components of Solar Assisted APU System		
S.No	Component	Function
1	Photovoltaic Panels	Convert solar energy into electrical energy
2	Charge Controller	Regulates voltage and prevents overcharging of batteries
3	Battery Storage System	Stores generated energy for later use
4	Power Management Unit	Distributes power to aircraft systems efficiently
5	Auxiliary Power Unit	Provides electrical and pneumatic power support

3. CONCLUSIONS

This project shows that using solar energy to support an aircraft's APU is a practical and meaningful step toward greener aviation. By placing lightweight solar panels on the fuselage, it is possible to generate extra electrical power without disturbing the aircraft's performance. The stored energy helps reduce the load on the APU, which in turn lowers fuel usage and emissions.

Overall, the idea is simple but effective—it doesn't replace existing systems but supports them in a smarter way. With further development, this approach can contribute to making aircraft more energy-efficient and environmentally friendly in the future.

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