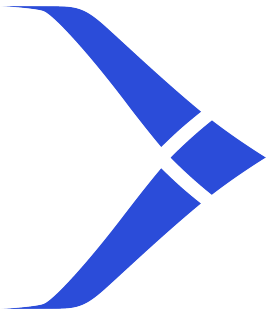

Engineering Project Proposal

GOAERO

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1 Project Outline

The Objective of this engineering project is to design and build a power distribution unit (PDU) for a drone of a maximum takeoff mass of 400Kg. The drone is an octacopter with motors running at 120V. Each motor requires a current of approximately 210A at maximum thrust. The PDU will be required to distribute power from four battery packs to the eight motors, ensuring that each motor receives the correct voltage and current. The PDU must also include safety features such as overcurrent protection, short-circuit protection, and thermal management to prevent overheating.

The project will involve selecting appropriate components, designing the circuit layout, and testing the PDU to ensure it meets all performance and safety requirements. Each PDU consists of 4 power distribution boards (PDBs) connected in to 4 battery packs. Each PDB must consists of 4 output branches capable of handling total continuous current of 350A with peak currents of up to 450A for short durations. This ensures that even if one of the 4 PDB fails, the drone can still operate and land safely. Furthermore, each PDB has dual redundant power inputs so that there are no single points of failure in the power distribution system.

2 Timeline

The project is expected to be completed over a period of 18 weeks, with the following milestones:

1. **Week 1-2:** Requirements gathering and literature review
2. **Week 3-4:** Research and component selection
3. **Week 5-6:** Circuit design and simulation
4. **Week 7-8:** PCB design and validation
5. **Week 9-10:** PCB Procurement
6. **Week 11-12:** Initial testing and debugging
7. **Week 13-14:** Performance optimization
8. **Week 15-16:** Final testing and validation
9. **Week 17-18:** Documentation and project report

3 Final Deliverables

The final goal of this project is to test this PDU under a simulated load according to the mission profile of the productivity mission of the GoAERO competition. The productivity mission requires the drone to ferry a total payload of minimum 567Kg. This is achieved by flying 14 segments of 3,2Km each, with a total flight time of 56 minutes.[1]

This simulated load would mimic the current draw of the motors during different flight phases in a bench test setup. With this, the distribution of current across the PDB branches can be checked.

4 Requirements

Name	Requirements
SYS-1	Each PDB shall distribute electrical power to 4 motors without introducing a single point of failure in the PDU
SYS-2	The PDU shall support continued controlled flight following the loss of any single PDB unit.
SYS-3	The PDB shall operate safely under all foreseeable flight, ground, and fault conditions.
ELEC-1	Nominal DC bus voltage shall be 120V DC.
ELEC-2	Each PDB shall support 350A of Continuous and 450A of burst current.
ELEC-3	The total system shall support current upto 1800A.
ELEC-4	Each PDB shall have two independent high-voltage power inputs.
ELEC-5	Loss of one input shall not interrupt PDB operation.
ELEC-6	Reverse current flow into a failed or disconnected input shall be prevented.
ELEC-7	Each branch of PDB shall be capable of supplying the maximum expected ESC current without overheating or excessive voltage drop.
ELEC-8	Each branch shall include independent overcurrent protection.
ELEC-9	Short circuits on the main HV bus shall be detected and isolated before cascading failures occur.
HEAT-1	The PDB shall operate within component temperature limits under continuous maximum current.
HEAT-2	Thermal overload shall result in controlled derating or isolation, not sudden failure.
MECH-1	High-current paths shall be implemented using busbars, not PCB copper alone.
MECH-2	Positive and negative conductors shall be arranged to minimize loop inductance.
MECH-3	Mechanical mounting shall withstand vibration, shock, and thermal cycling expected in UAV operation.
SENS-1	Each PDB shall measure its own output current.
SENS-2	Each PDB shall measure its own input voltage.
SENS-3	Each PDB shall measure its own temperature at critical points.

Table 1: System and Electrical Requirements

References

[1] *GoAERO Prize | HeroX*. Herox.com, 2026. URL: https://www.herox.com/goaero/295-technical-rules.