UAV BATTERY EFFICIENCY ESTIMATOR

USER GUIDE

1. Getting Started

Select a drone from the dropdown menu. The app will display its power system, base weight, and max payload. For custom builds, define your own motor setup.

2. Main Features

- Battery Capacity (Wh): Capped at 1850 Wh.
- Payload Weight (g): Validated against drone's max lift.
- Flight Speed, Wind, Temperature, Altitude, and Elevation Gain define the flight profile.
- Flight Mode: Hover, Forward Flight, Waypoint Mission.
- Real-time feedback: power draw, flight time, and energy usage are shown during simulation.

3. Key Calculations

- Air Density Factor: Simulates thin air at altitude.
- Climb/Descent Energy: Weight-based energy adjustments.
- Battery Adjustments: Based on temperature, load, and altitude.

4. Test Scenarios

1. Exceeding Payload Capacity -> should trigger an error.
2. Climb Energy Deduction -> subtracts Wh from battery.
3. Descent Recovery -> adds Wh back.
4. Cold/Hot Weather -> reduces battery capacity.
5. Battery Size Warning -> triggers tip if undersized.
6. High Altitude Efficiency -> shows reduced air density.
7. Real-Time Feedback -> live battery gauge and timer.

5. Best Practices

- Keep payload below 70% for optimal efficiency.
- Use realistic battery sizes.
- Watch for climb energy costs and descent recovery gains.
- Validate mission profile under wind and temperature extremes.

6. Summary

This guide helps you simulate, test, and optimize UAV missions using real-world physics, battery behavior, and mission-critical calculations.