

# Title

ORNITHOPTER EXOSKELETON – FULL PROJECT GUIDE

## Concept Overview

This project explores human-powered flapping flight assisted by an exoskeleton with actuated wings. It draws inspiration from large birds and biomechanical engineering. The design includes a carbon fiber and aluminum alloy frame with battery-powered BLDC actuators. Wings span 14 meters total and are controlled by a central logic board interpreting EMG muscle signals.

## Sourcing & Materials

Main structural materials: carbon fiber tubes, aircraft-grade aluminum, ripstop nylon, Kevlar thread. Mechanical parts: high-torque brushless DC motors, gearboxes, linear actuators, hinges, ball joints. Electronics: Arduino or STM32 MCU, EMG sensors, IMU, Li-ion battery packs, ESCs, BMS. Safety: parachute, padding, harness, fail-safe actuator locks.

## Suppliers

- McMaster-Carr – Hinges, ball joints, fasteners - HobbyKing – BLDC motors, ESCs, batteries - AliExpress – EMG sensors, controllers - Amazon – Frame tubes, safety padding - OpenBuilds – Aluminum brackets

## Build Phases

Phase 1 – Frame fabrication Phase 2 – Wing membrane and folding Phase 3 – Motor install and gearing Phase 4 – Harness + spine plate setup Phase 5 – Control system integration Phase 6 – EMG & motion testing Phase 7 – Safety system and parachute Phase 8 – Static wing flap test Phase 9 – Assisted gliding tests

## Timeline

The full build and test cycle spans 6 months. Initial fabrication and electronics take 2–3 months; integration and testing take the remainder. See the CSV and Gantt chart for dependencies.

## **Costs**

Estimated cost: \$7,500–\$12,000 depending on component availability, with motors, batteries, and carbon fiber being the most expensive items.