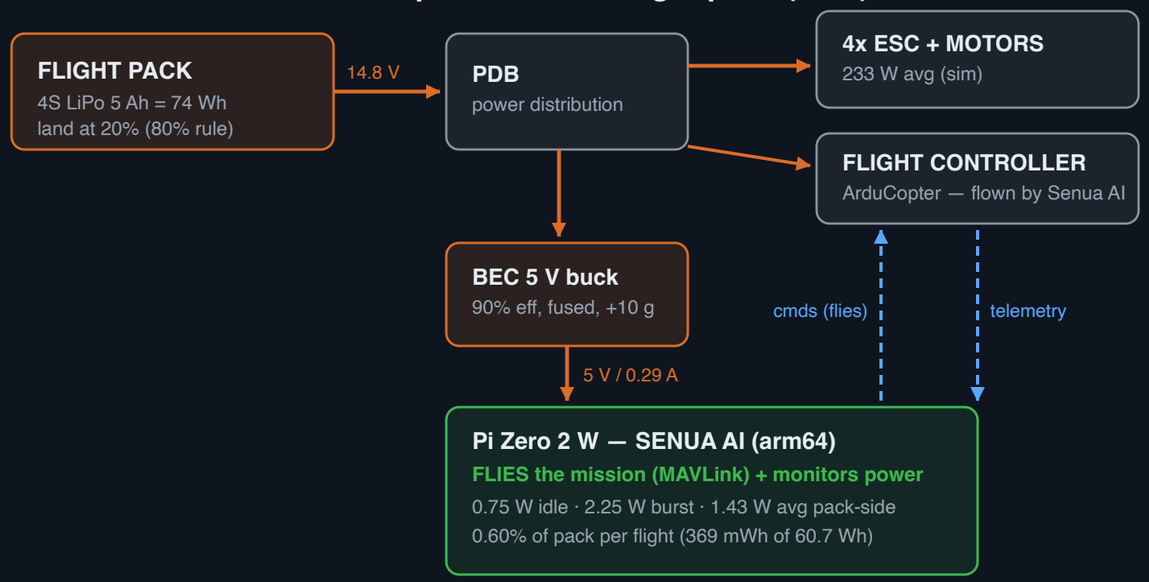
UAV companion power — shared flight pack vs separate cell

Senua AI FLIES the autonomous mission AND monitors its power (proven: SITL missions + QGroundControl record). Simulated: 4S 5 Ah (74 Wh), 2 kg quad, 250 W hover. Sim: validate/power/battery_sim.sx *

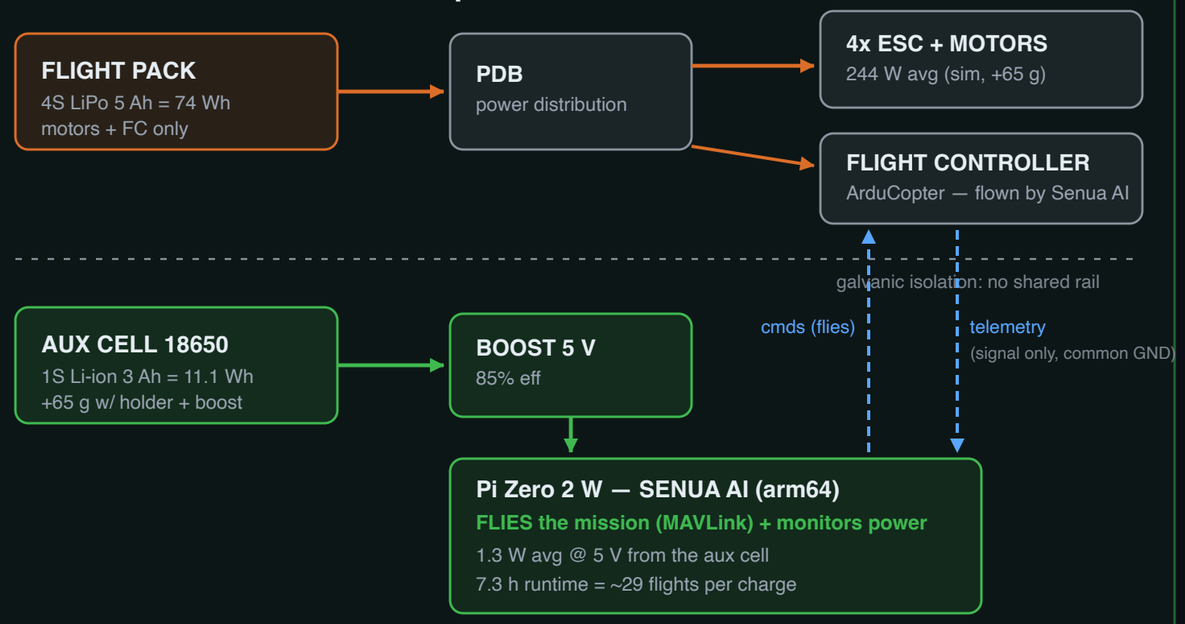
OPTION A — SHARED: companion on the flight pack (BEC)



PRO no extra mass (+10 g BEC) -> LONGER flight than option B (+34 s, sim)
one battery to charge / preflight; companion sees the true flight rail

CON voltage sag + ESC noise on shared rail (brownout risk; needs good buck + fuse)
monitor dies with the aircraft power -> no post-crash black box
pack swap power-cycles the monitor; bench work drains the flight pack

OPTION B — SEPARATE: companion on its own cell



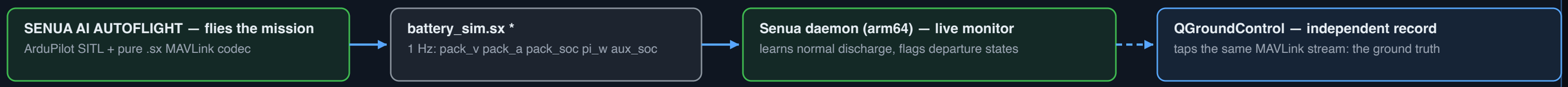
PRO isolated from sag / ESC noise / pack faults; survives main-pack cutoff + crash
black-box keeps recording; monitor state survives pack swaps; bench-safe

CON +65 g costs 12.2 W hover = 8.5x the companion's own draw (sim)
second charge/preflight workflow (forgotten-flat risk); own SoC to monitor
shorter flight than option A (-34 s, sim)

Simulated result * — the flight pack discharges 163x faster than the companion drains

A: flight 15.5 min · pack avg 233 W vs companion 1.43 W = 163 : 1 · companion share 0.60% (369 mWh of 60.7 Wh) · cost of feeding the Pi from the pack: ~34 s
Companion ALONE on the usable pack: ~41 h vs 15.5 min of flight. B: aux 18650 runs 7.3 h (~29 flights) but its 65 g costs 12.2 W hover = 8.5x the companion's draw.
All figures are integers agreed by the three independent implementations * — summaries equal, telemetry CSVs byte-identical (md5-verified).

AWS test harness — arm64 (Graviton) node, e.g. senua-autoflight-1



* the simulation is written in THREE stacks — Simplex (validate/power/battery_sim.sx, primary), Python (.py), C (.c) — same integer model + RNG; all three produce byte-identical telemetry CSVs and equal summaries, cross-confirming the numbers across code stacks.
NOTE: the original Pi Zero W is ARMv6 32-bit; the arm64 Senua build needs a Pi Zero 2 W or better (same power class). Autonomous flight is REAL, not simulated marketing: Senua AI has flown full SITL missions via its pure-Simplex MAVLink codec — on video, with QGroundControl telemetry