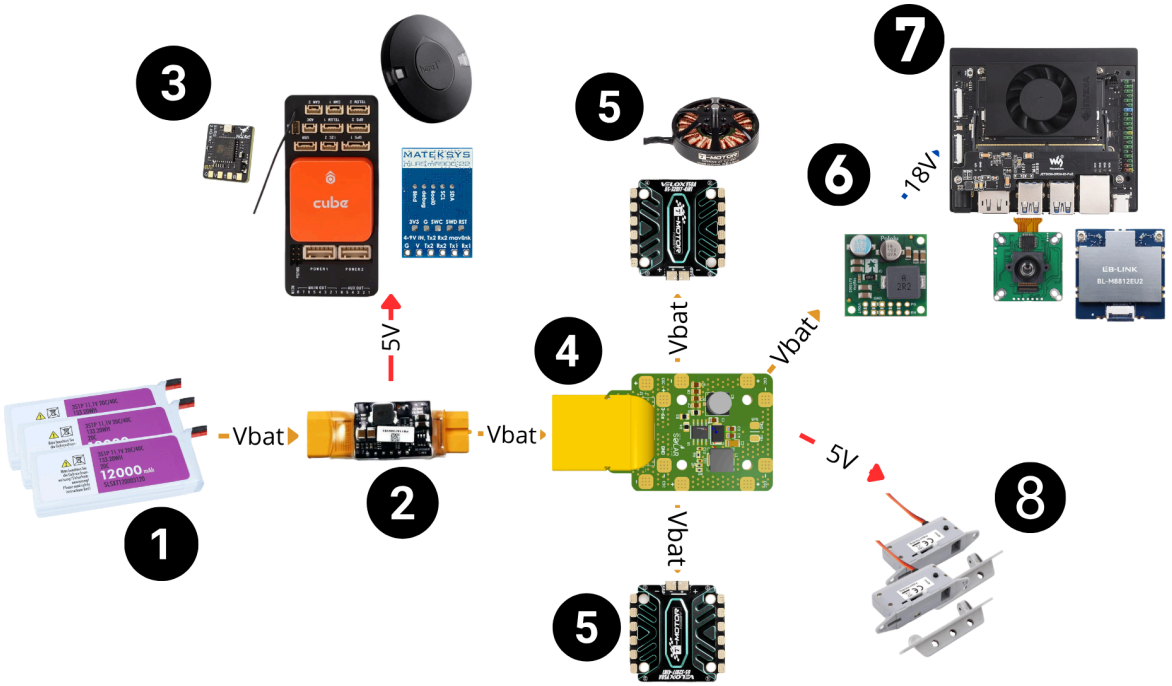
Świerszcz: Onboard Electronics

Świerszcz uses a layered electronics architecture: flight-critical functions remain on the Cube Orange+, while computationally demanding vision and mission tasks run on a separate NVIDIA Jetson Orin Nano. This separation prevents a high processor load or software failure in the autonomy stack from directly affecting stabilization and basic flight safety.

Power is organized in the same way: one monitored main supply feeds a team-developed distribution board, and dedicated branches supply propulsion, onboard computing and payload mechanisms. Control, telemetry and imagery also use separate radio links, reducing the chance that interference in one band disables the entire aircraft.



Main electronics and power architecture. Numbers correspond to the system descriptions below.

1. Main battery pack

The aircraft is powered by a 6S LiPo battery pack assembled from three SLS XTRON 12000 mAh 2S batteries connected in series. The pack supplies the complete onboard electrical system with the main unregulated battery voltage.

2. Pixhawk power module

A Pixhawk-compatible power module is installed directly after the battery. It powers the Cube Orange+ through the POWER1 connector while simultaneously measuring the total battery

voltage and current. Since the module is placed before the power distribution board, all onboard power consumption is monitored.

3. Flight control and communication

The flight-control subsystem consists of the Cube Orange+, Here 3+ GNSS receiver, Matek mLRS MAVLink 900 MHz telemetry module and the RC receiver. The Cube Orange+ performs stabilization, navigation, mission execution and failsafe management, while telemetry and manual control are transmitted over independent communication links.

4. Power distribution board

The aircraft uses a dedicated AGH Solar Plane power distribution board designed for 3–6S battery systems. The board distributes the main battery voltage to four independent high-current outputs, supplying both propulsion controllers and the companion-computer power regulator. An integrated 5 V buck converter provides a separate regulated supply for the payload-release mechanisms. Wide copper traces and large solder pads simplify assembly while minimizing power losses and connector count.

AGH Solar Plane power distribution board during assembly.

5. Propulsion system

The propulsion system is driven by two T-Motor Velox V50A 4-in-1 electronic speed controllers. Each ESC controls four T-Motor MN4006 KV380 brushless motors, resulting in a total of eight motors in the coaxial X8 configuration.

6. Companion computer power supply

A Pololu 5578 (D42V55F18) step-down regulator converts the varying 6S battery voltage into a stable 18 V output capable of supplying up to 4 A. This dedicated regulator powers the NVIDIA Jetson Orin Nano independently of the flight-control electronics.

7. Companion computer and vision system

The onboard computing subsystem is built around the NVIDIA Jetson Orin Nano. Visual data are acquired using an Arducam B0429 camera based on the Sony AR0234 2.3 MP global-shutter sensor. Image transmission is provided through an LB-LINK BL-M8812EU2 wireless module mounted on a custom carrier board that integrates power distribution, USB connectivity and antenna interfaces.

8. Payload-release mechanisms

Two E-flite Servoless Payload Release (EFLA405) mechanisms are powered from the dedicated 5 V output of the power distribution board and controlled independently through auxiliary outputs of the Cube Orange+ flight controller.

A GoPro 11 is used as a backup recording device and operates from its own internal battery, making it electrically independent of the aircraft's main power distribution system.