SakSat‑1 CubeSat — BOM, Build & Software Guide

Audience: subsystem engineers and integration & test team. Follow steps sequentially; sign off via JIRA tickets.

# Bill of Materials (Flight Model)

|  |  |  |  |
| --- | --- | --- | --- |
| Subsystem | Component / Link | Qty | Unit USD |
| Structure | ISIS 1U Structure https://www.isispace.nl/product/1u-structure/ | 1 | 3000 |
| EPS | EnduroSat EPS I https://satcatalog.com/product/eps-i/ | 1 | 4500 |
| Battery | Li‑ion pack 20 Wh (2× INR18650‑35E) + PCB | 1 | 120 |
| Solar Cells | AZUR 3G30C, 29 % https://azurspace.com | 8 | 1120 |
| OBC PCB | STM32H7 custom board https://github.com/kiu-cubesat/obc | 1 | 200 |
| Jetson Nano | NVIDIA Jetson Nano Module https://developer.nvidia.com/jetson-nano | 1 | 100 |
| Camera | ArduCam OV5647 5 MP https://www.arducam.com | 1 | 25 |
| Comms | Custom UHF radio PCB https://github.com/kiu-cubesat/uhf-radio | 2 | 1000 |
| Antennas | Tape Spring Dipole material + Burn wire | 2 | 50 |
| ADCS | Torquer PCBs + Magnetometer (LSM303AGR) | 1 set | 300 |
| Heaters | Kapton 1 W polyimide 25 × 25 mm | 2 | 20 |
| Fasteners | M2.5 A4‑70 screws, spacers | - | 30 |

Total satellite hardware ≈ US$11 465

# Assembly Workflow

1. PCB Fabrication: order 4‑layer boards from JLCPCB; minimum 1 oz copper. Conformal‑coat with Humiseal 1B31.

2. Structure prep: deburr slot edges; install kill‑switch leaf springs (C&K TFS).

3. Mount EPS on baseplate; torque M2.5 screws to 0.3 Nm; connect battery via Molex MicroFit with quick‑disconnect.

4. Solar panels: solder cell tabbing wire; stake leads with RTV 560; use Dow Corning 93‑500 for edge sealing.

5. OBC stack: insert board into PC/104 standoffs; route CAN bus twisted pair and camera CSI flex cable.

6. Jetson thermal: attach 1 mm graphite pad and 2 mm Al heatspreader to structure wall with Arctic Silver epoxy.

7. Radio: solder CC1120 + PA; validate output +30 dBm @ 435 MHz on spectrum analyser. Attach MMCX feedthrough.

8. Antenna stow: tape‑measure blade 17.2 cm each side; pin with 0.06 mm Dyneema + nichrome loop (burn 1 A 3 s).

9. Torquer coil test: 0.25 A produces ≥0.09 A·m dipole; verify via Helmholtz cage.

10. Vibe potting: apply MG‑Chemicals epoxy on all high‑mass components.

# Software Bring‑Up

• Flash OBC via ST‑Link: ‘obc\_firmware.bin’. Run unit tests ‘make test’.

• Install Jetson OS: flash jetson-nano-qspi-sd r35.3.1; disable GUI (`sudo systemctl set-default multi-user`).

• Copy `/home/ai/models/resnet18.trt`; test inference time (expect 46 ms).

• Build flight‑software repo; run Hardware‑in‑the‑Loop with px4‑sim for ADCS.

• Radio checkout: inject AX.25 test frames from ground SDR; verify CRC OK.

# Environmental Testing Procedure

♦ Random vibe 14 grms 20–2000 Hz, 2 min/axis.

♦ TVAC: −20⇄+60 °C, 6 cycles, monitor battery temperature.

♦ Deployment: place satellite on turntable; fire burn‑wire; antenna must reach full extension < 0.5 s.

♦ EMI: measure conducted emissions < 45 dBµV @ 10 MHz.

# Code & Documentation Repositories

https://github.com/kiu-cubesat/obc (C / FreeRTOS)

https://github.com/kiu-cubesat/payload-ai (Python / TensorRT)

https://github.com/kiu-cubesat/uhf-radio (KiCad, C driver)

https://github.com/kiu-cubesat/adcs-firmware (C++)

https://github.com/kiu-cubesat/ground-segment (Ansible, GNU Radio scripts)