

AstroBit: An Integrated Avionics and Software Platform for CubeSats

From Knowledge
to Competitiveness

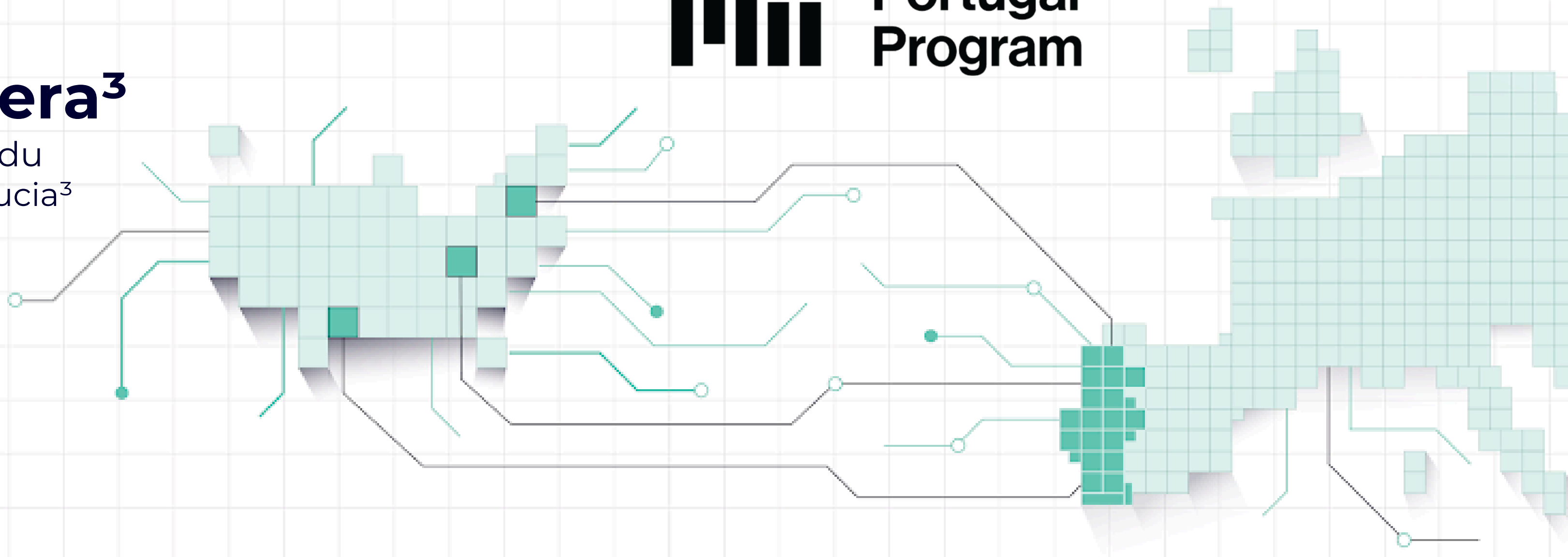
Portugal-US Partnerships 2026 Summit

MIT Portugal
Program

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1. MIT Aeronautics and Astronautics Department
2. NanosatLab, Institute for Systems and Robotics, Instituto Superior Técnico
3. CMU Electrical and Computer Engineering Department



Low-cost small satellites have tremendous potential to improve life on Earth.

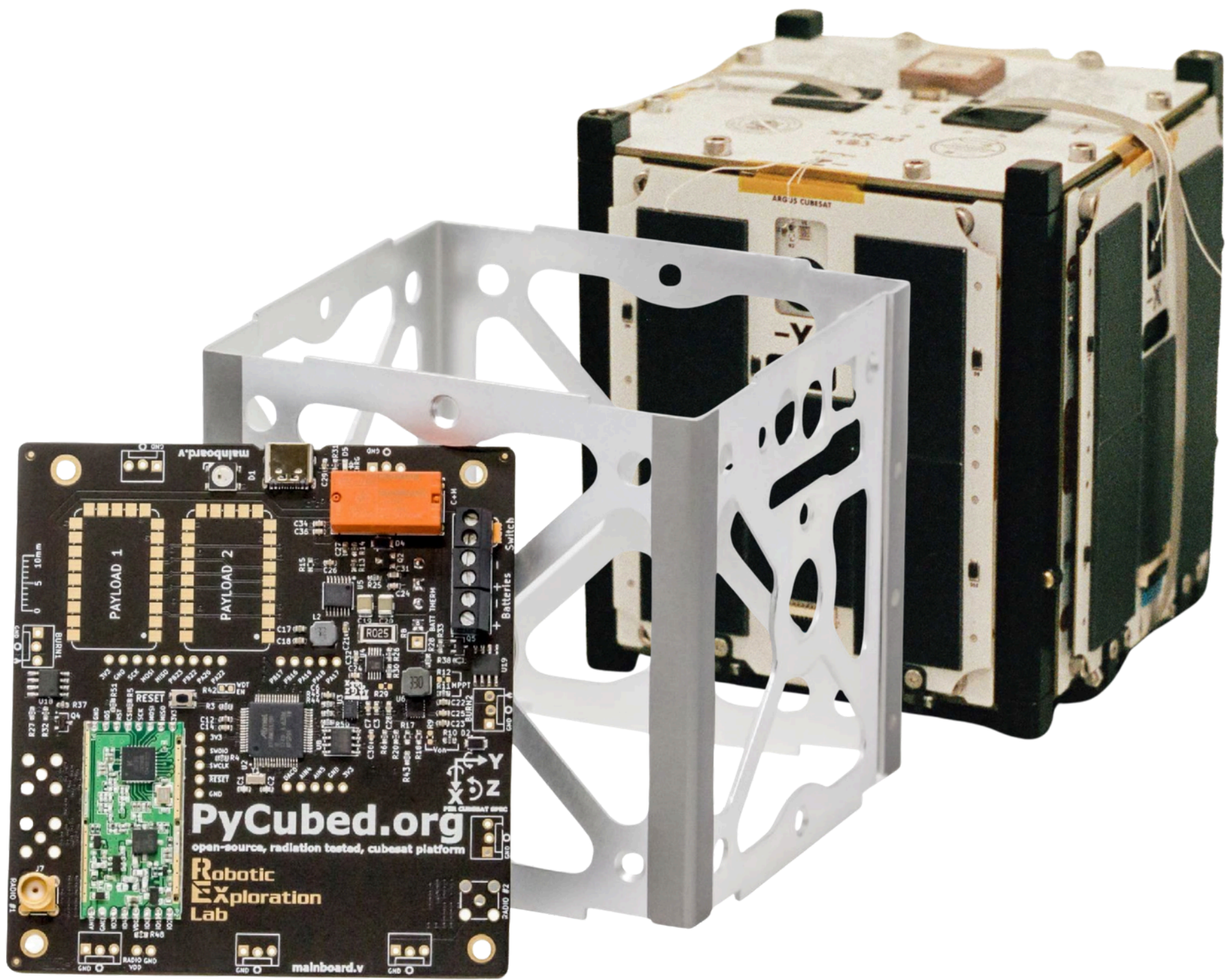
However, **CubeSat missions require substantial custom avionics and software integration**, creating repeated engineering effort across missions and institutions.

PyCubed provides an open-source single-board avionics platform designed to reduce this barrier.

Argus, a CubeSat mission developed collaboratively by MIT, Carnegie Mellon University, and IST NanosatLab, has provided design experience with PyCubed as a testbed for new avionics and software.

AstroBit builds on this collaboration, consolidating these developments into a reusable platform for future missions and education.

MPP Research Area: Space



The Big Picture

Cost

- CubeSat components can be exceedingly expensive

Complexity

- Requires immense engineering effort
- Failure rates for first-time CubeSats are catastrophically high

Background

PyCubed REXLab Expertise

- V-R3x - 2021
- PY4 - 2024
- Prometheus - 2025

Argus Mission Collaboration

MIT Capstone Avionics

IST NanosatLab Expertise

AstroBit Development

Task 1 - PyCubed Update

Argus Lessons → PyCubed + IST SDR Integration

Task 2 - Harmonization

PyCubed ↔ MIT Capstone

Task 3 - F' Software Integration

Port F' to PyCubed

Task 4 - Hardware Validation

Batch Assembly + Testing

Task 5 - Curriculum

Course + Open Materials

AstroBit's Impacts

Accessibility

- User-friendly
- Cheap
- Continually maintained

Reduced Non-Recurring Engineering Costs

- Start from a proven platform
- Efforts can focus on novel research rather than reintegration

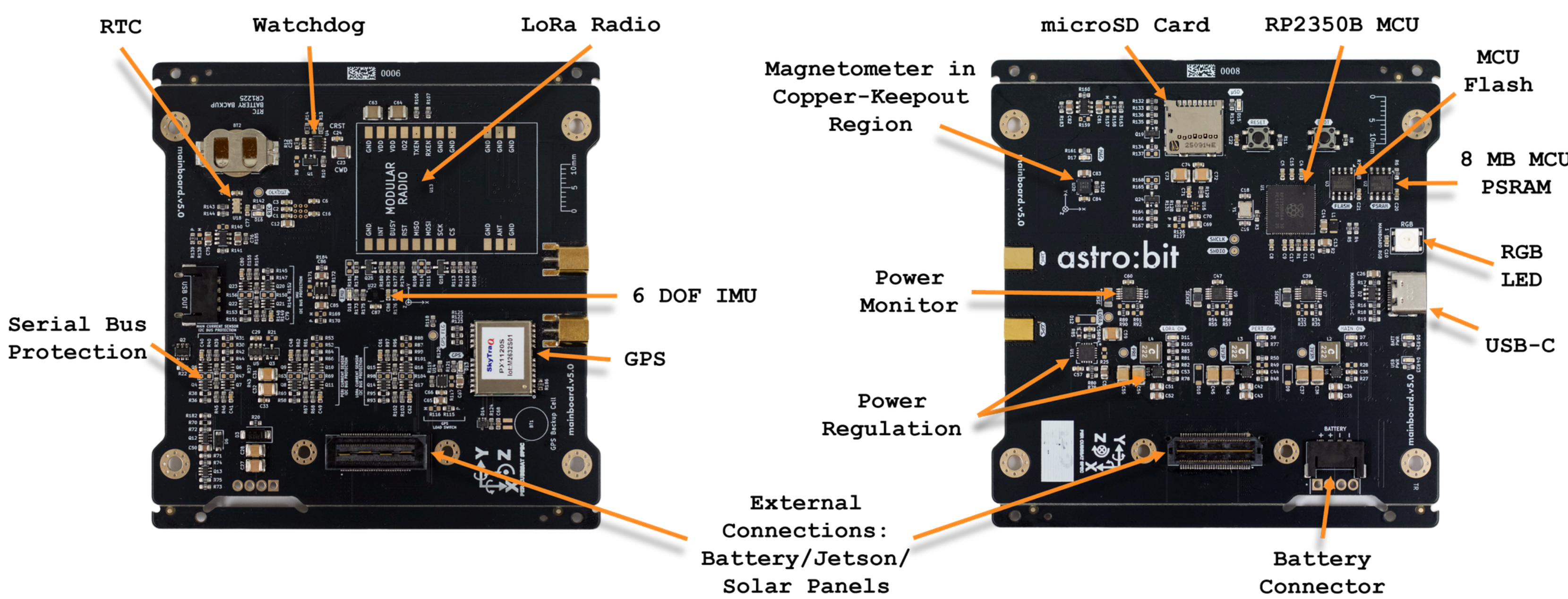
Knowledge Sharing

- AstroBit will be documented and open-source

Strengthening MIT's and IST's Role in Space Engineering Education

- AstroBit is a collaborative effort
- Future collaborative small-satellite missions

AstroBit delivers a platform that lowers the barrier to entry for space engineering, education, and research.



Funded by:

