MEROPE

Montana EaRth-Orbiting Pico-Explorer

Mike Obland

Project Manager

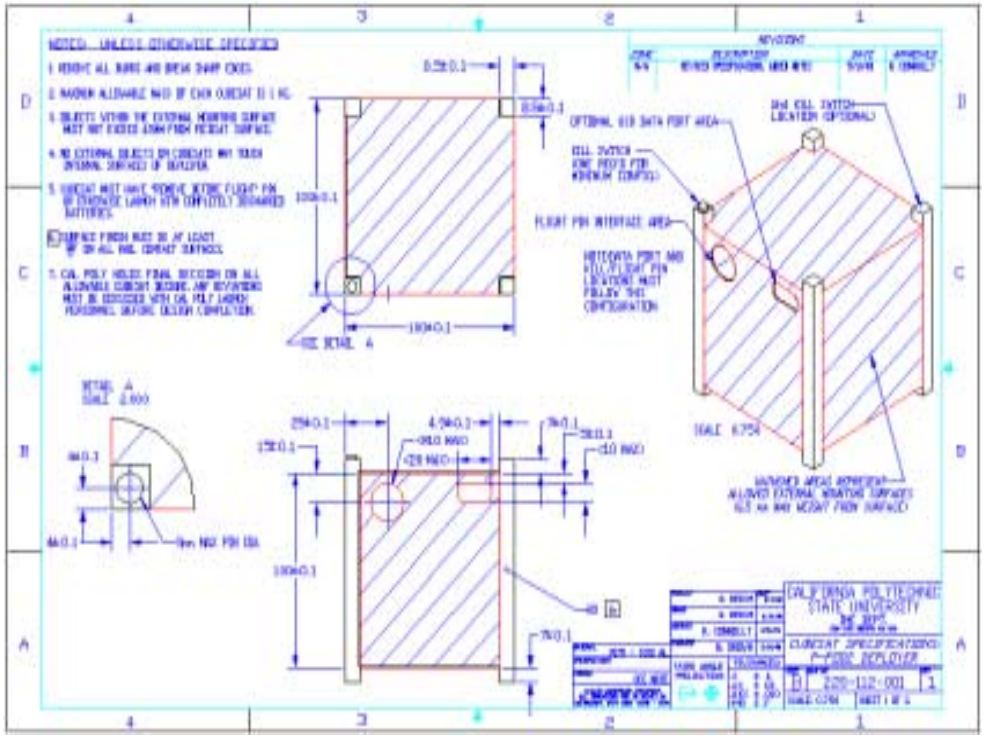
NASA National University Satellite Programs

April 5th, 2002

Montana **E**a**R**th-**O**rbiting **P**ico-**E**xplorer (**MEROPE**)

- Montana's 1st satellite
- MT Space Grant Consortium educational project
- 1st project of MSU's new **S**pace **S**cience & **E**ngineering **L**ab (**SSEL**)
- Completely student-run!
  - 4 graduate students
  - ~ 75 undergraduate students

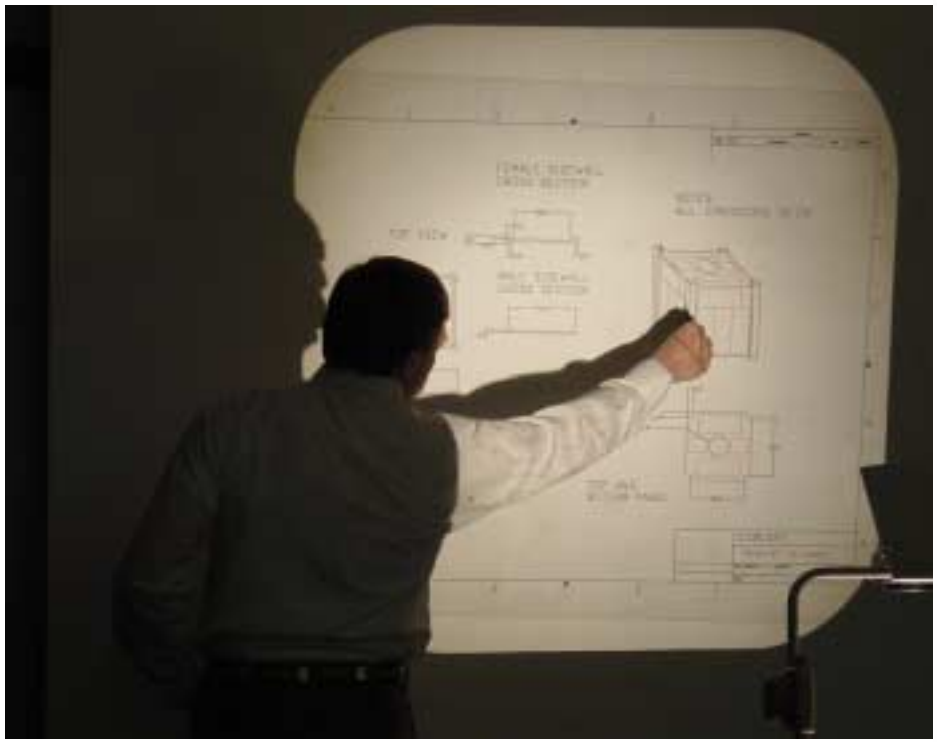
The **Mission**:

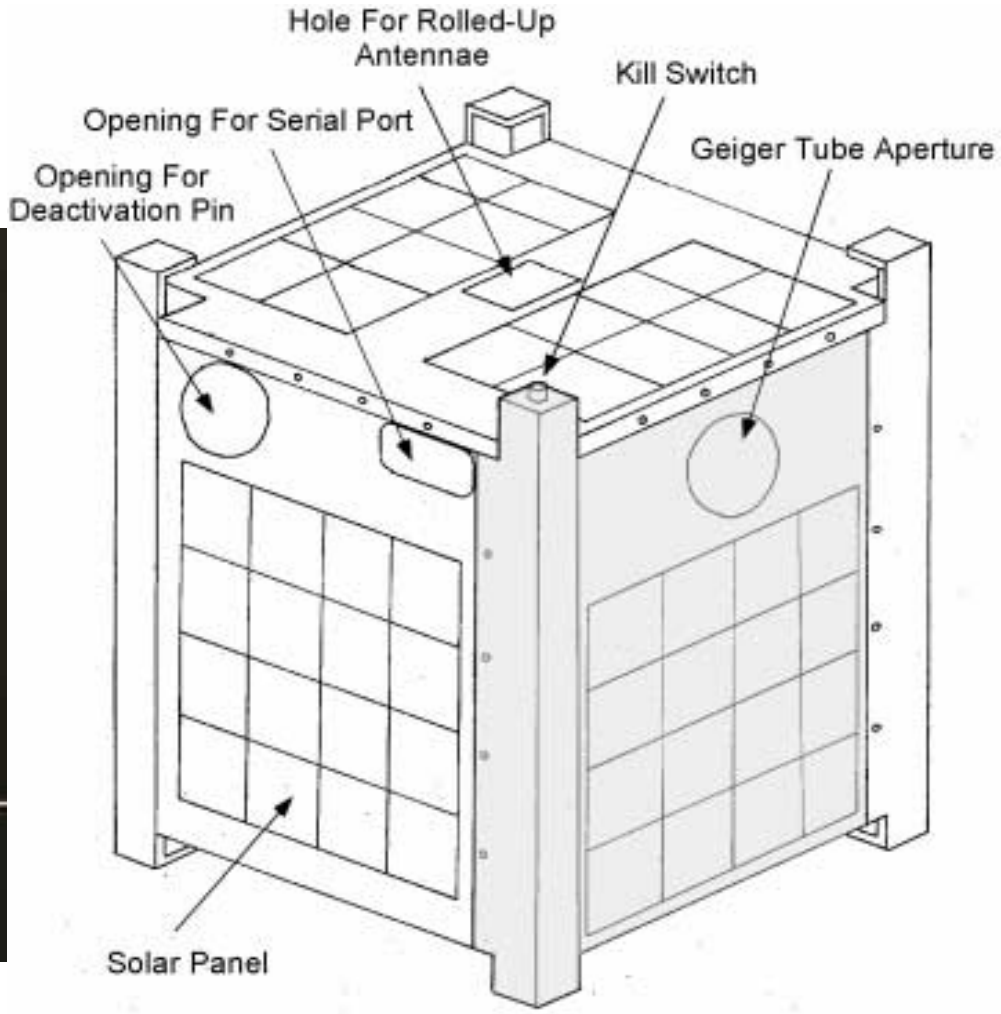


- Fully Functional
  - Communications
  - Onboard Computers
  - Strong Structure
  - Solar & Battery Power
- 10cm (~ 4 in) cube, 1kg (~2.2 lbs) total mass
- Built, tested, and delivered by late July, 2002
- Launch in November, 2002
  - From Kazakhstan onboard Dnepr SS-18

Montana EaRth-Orbiting Pico-Explorer

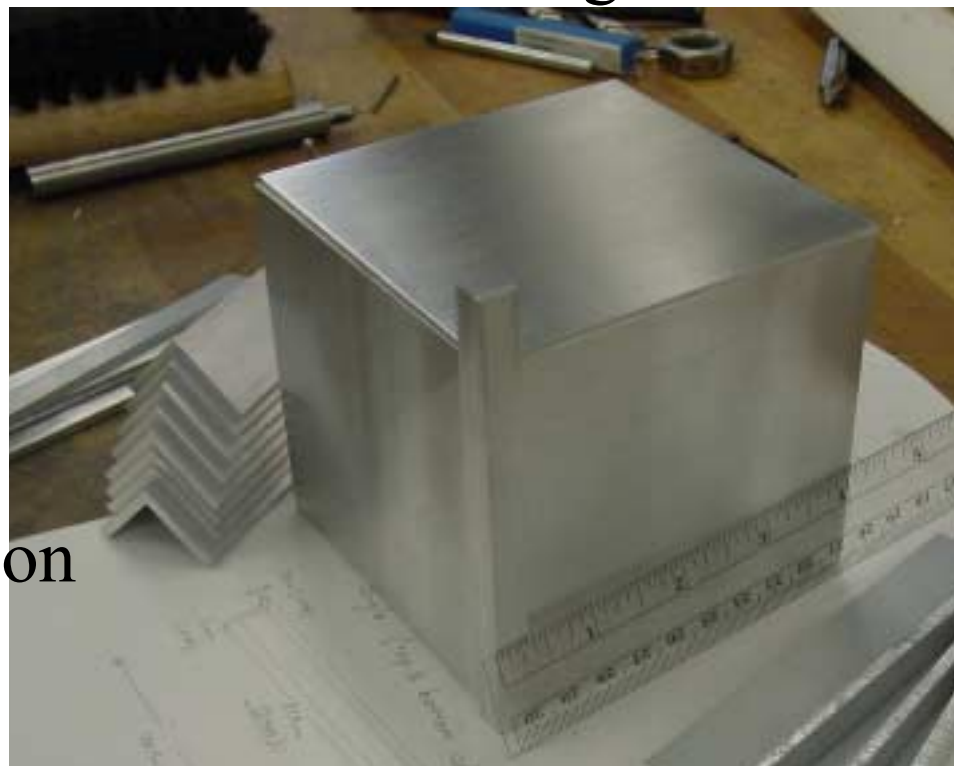
MEROPE:



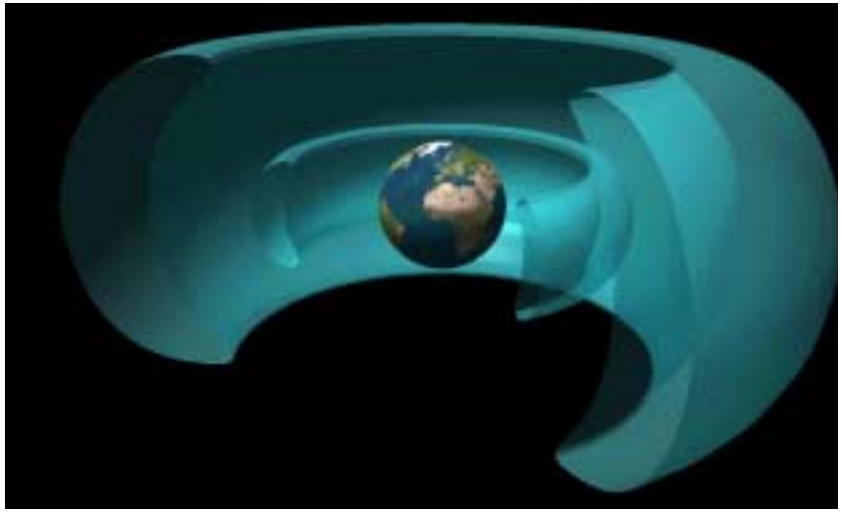


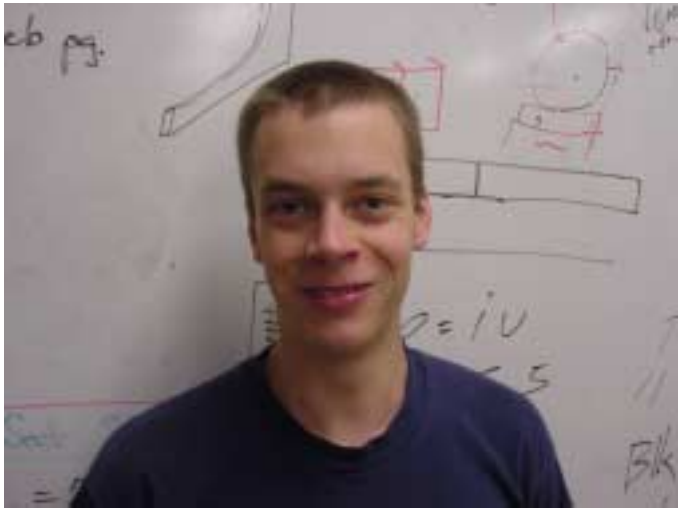
MEROPE Project Subsystems:

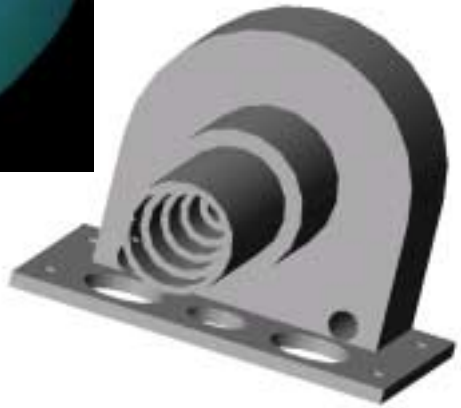
- Payload
- Flight Processor/Command & Data Handling
- Communications
- Power
- Mechanical & Structure
- Thermal
- Attitude Control
- Operations/Ground Station
- Integration & Test
- Business/Outreach



Our **Science Mission**:



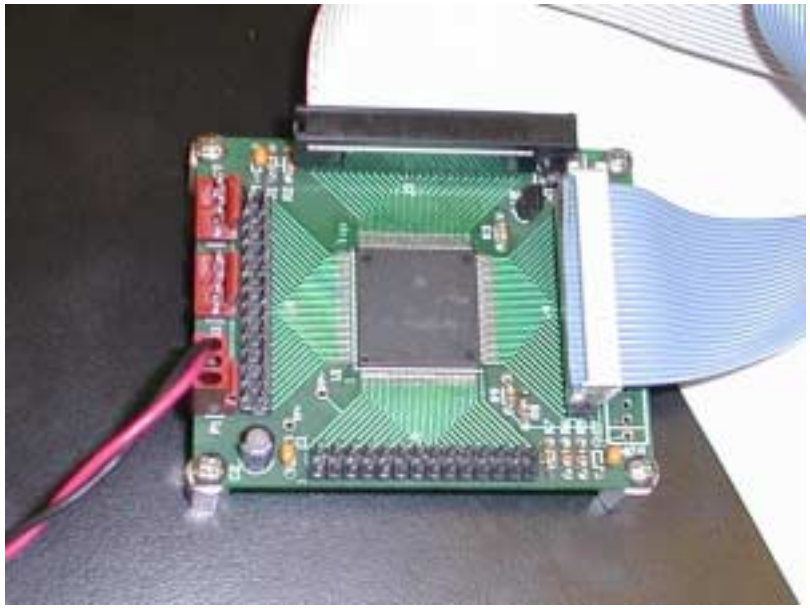


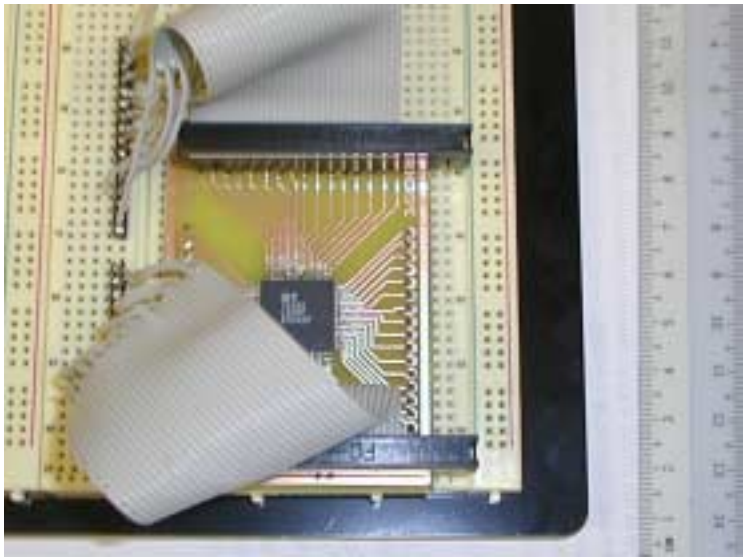


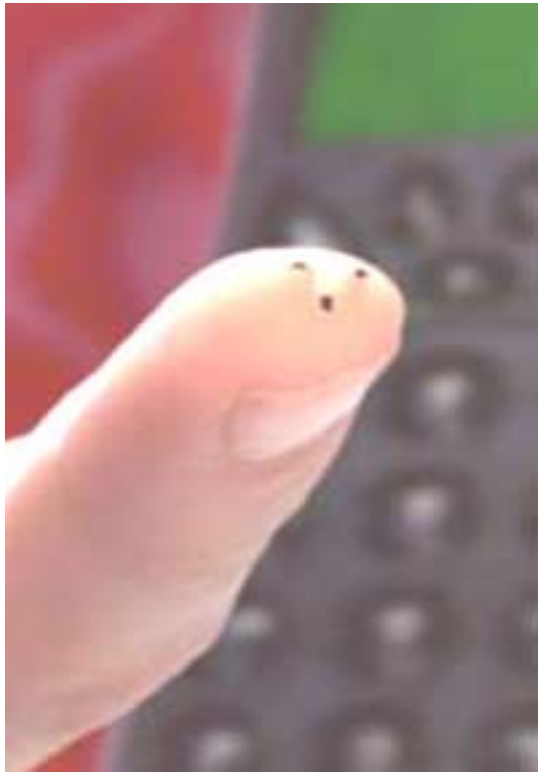
- Repeat experiment of **Explorer 1**
  - Dr James Van Allen, U. of Iowa; 1958
- Measure electron intensity of inner **Van Allen Radiation Belts**

MEROPE Firmware:

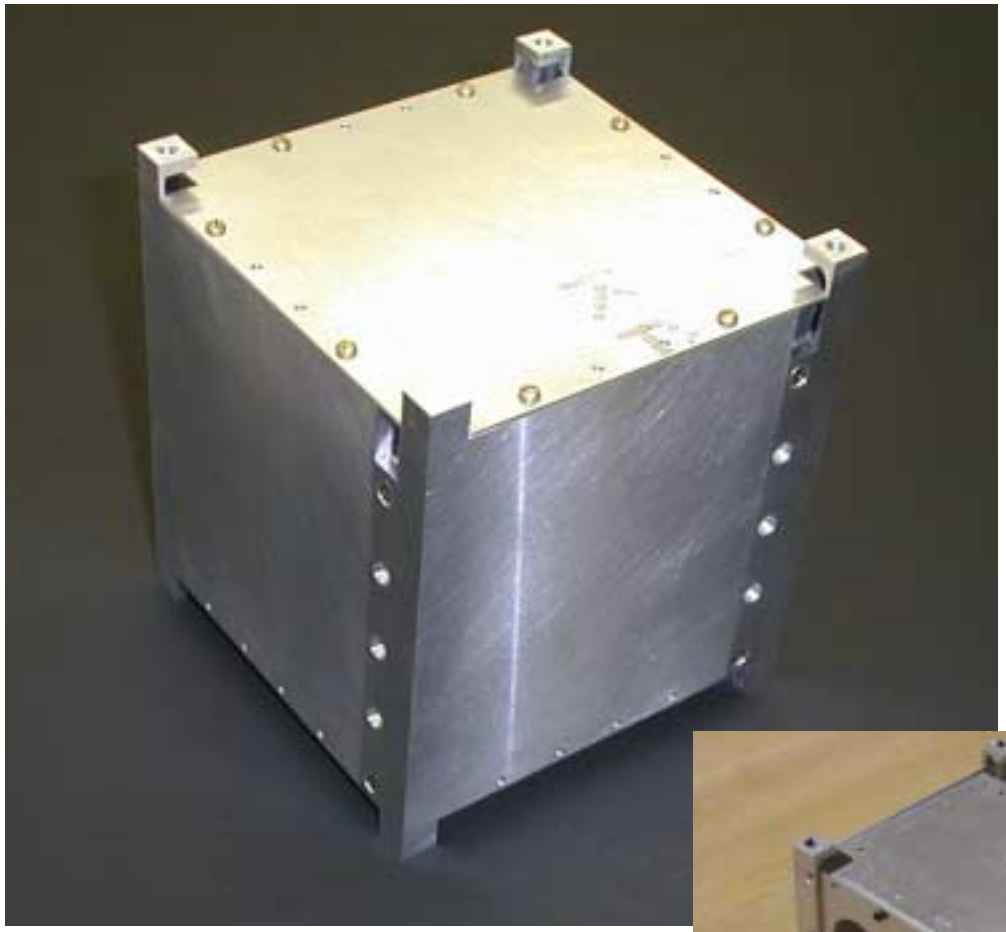
- Onboard computers
  - Motorola HC12 microcontroller
  - 128 Kbytes Integrated Device Technology FIFO RAM







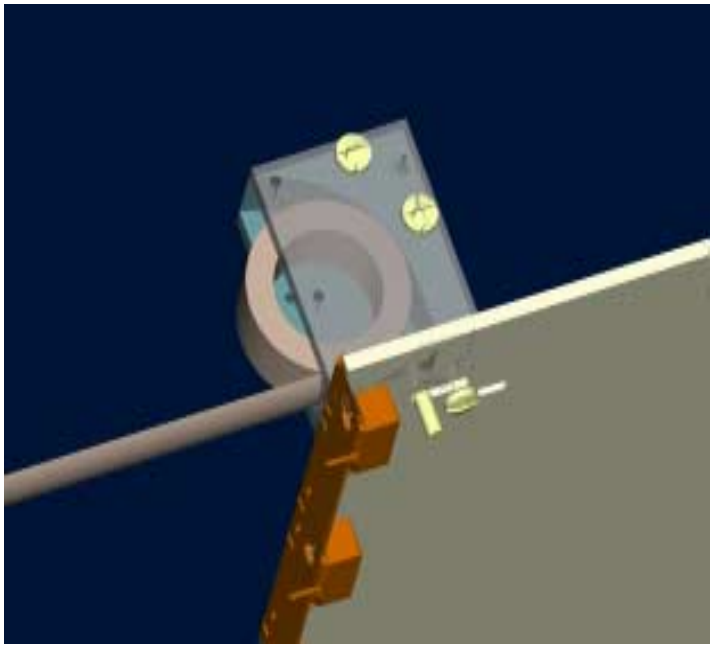
MEROPE Chassis:

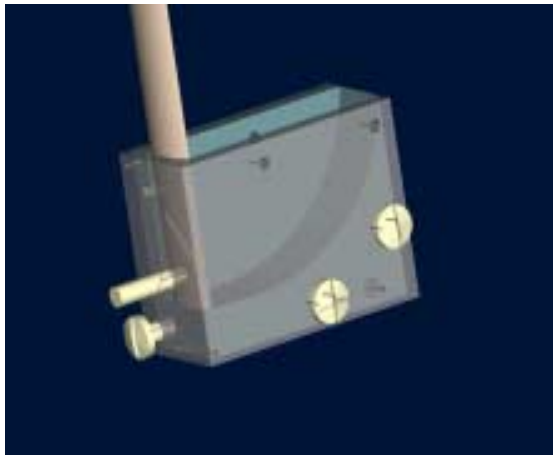


- Mass after cut-outs: 210 g
- Max. allowed tolerance: .007”
- Max. achieved tolerance: .003”

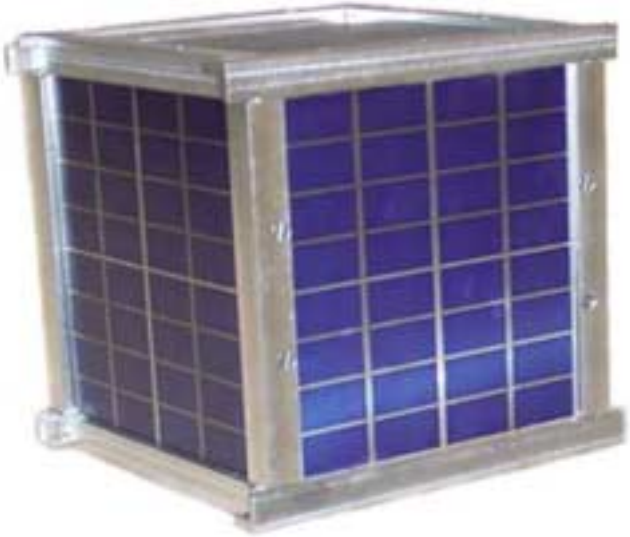
Antenna:

- Antenna housing made of Delrin plastic
- Nickel-Titanium Antenna
- Nylon/Burn Resistor Storage

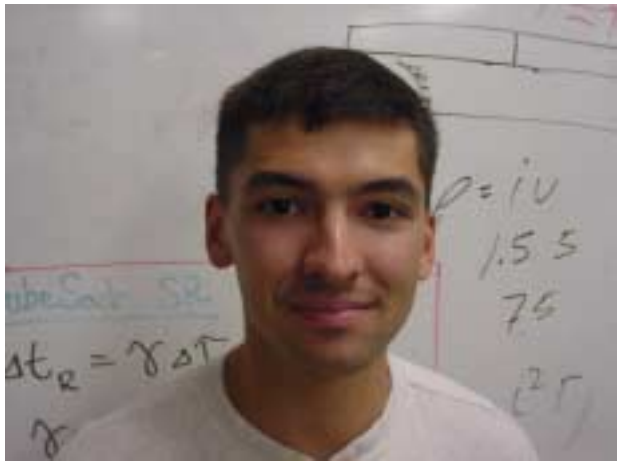


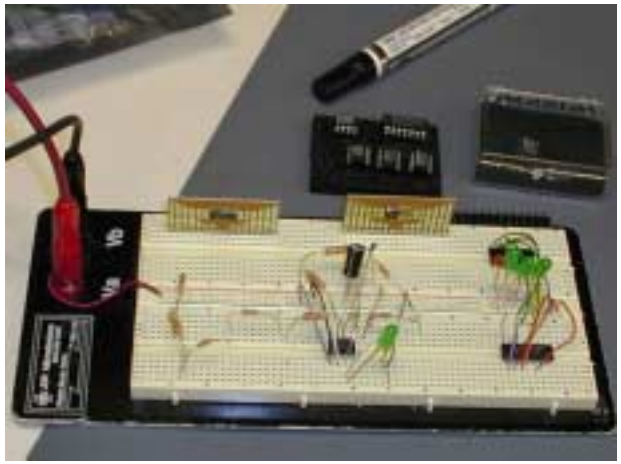


MEROPE Power System:

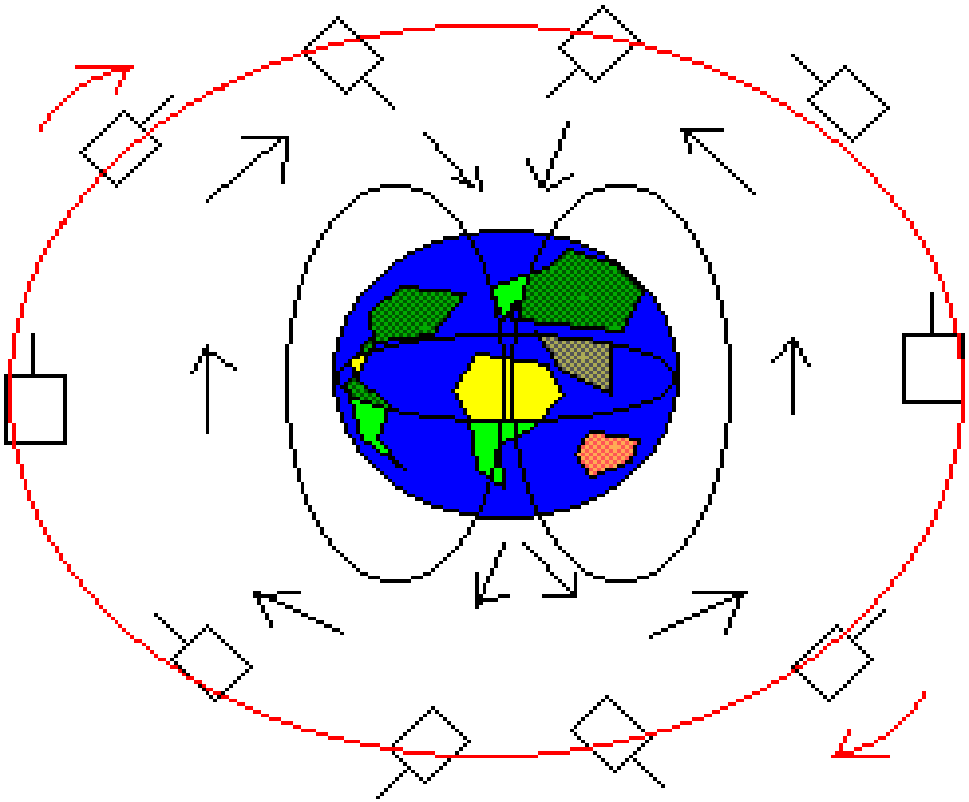


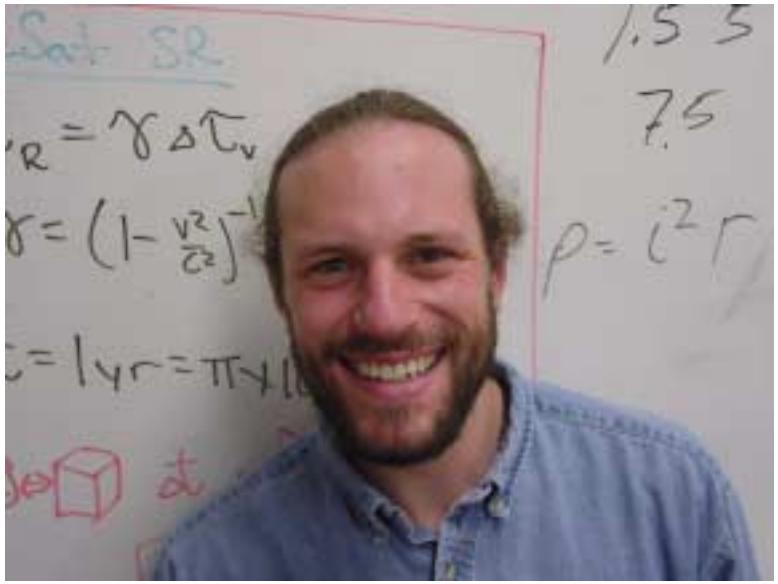
- Li-Ion batteries
  - 84.4 g total
- Power budget:
  - 1.6 W normal
  - 6.3 W downlink (w/ transceiver)
- 23% GaAs solar cells
  - Power Generation: 1.68 W to 4.36W



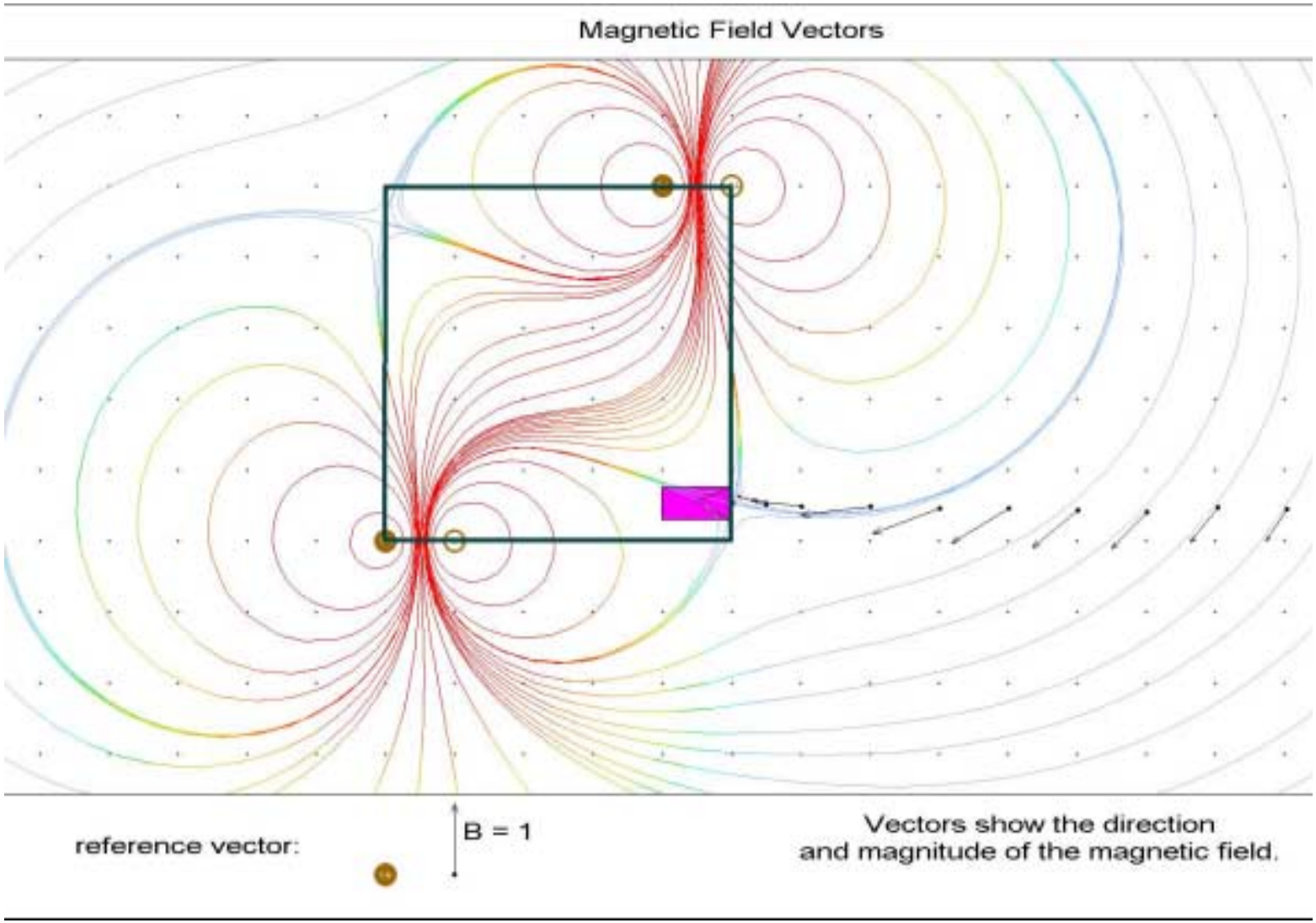


MEROPE Attitude Control:

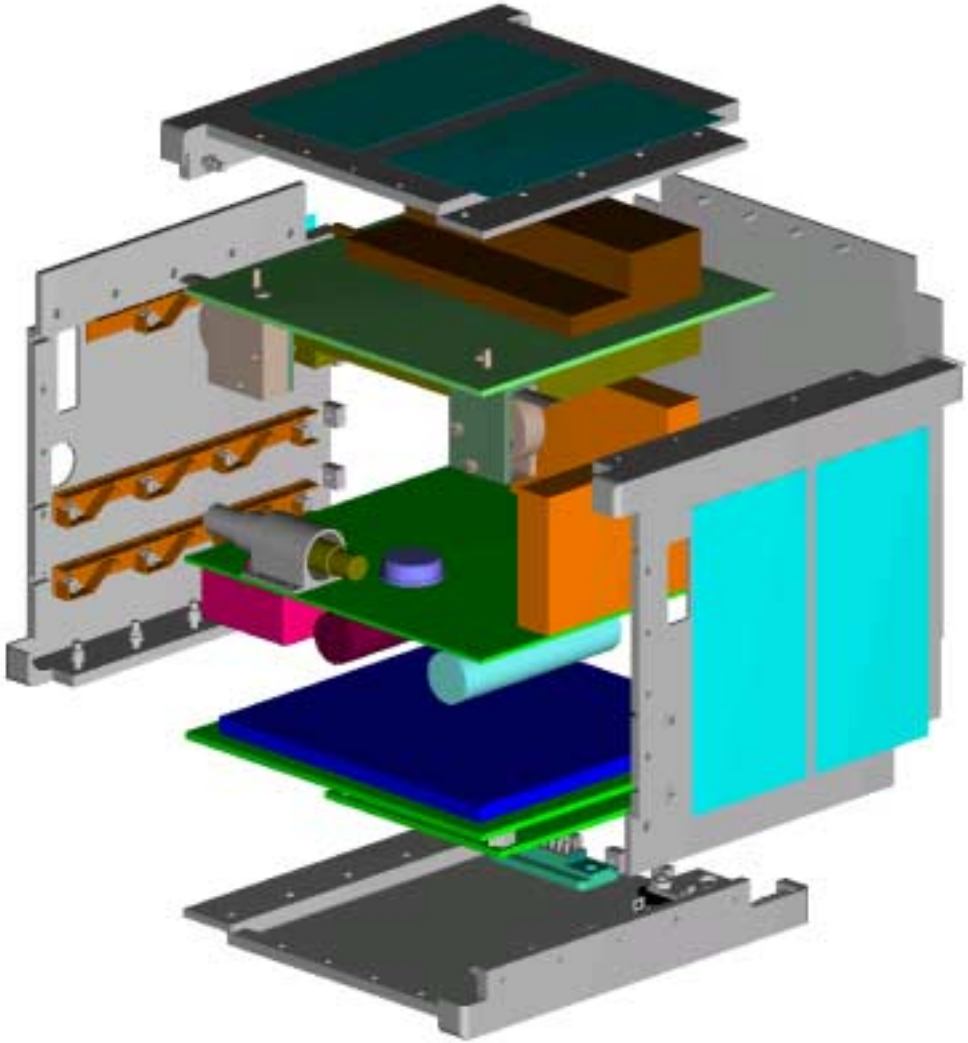


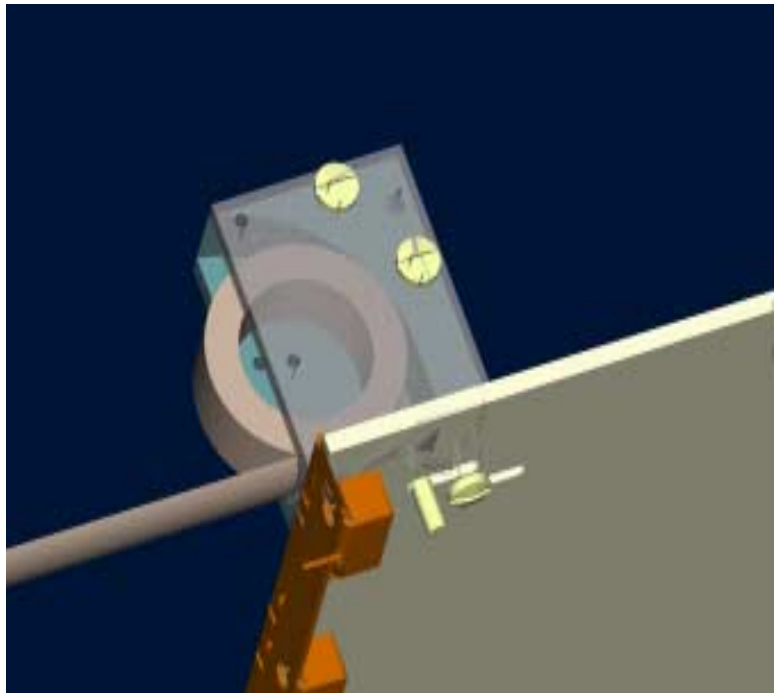


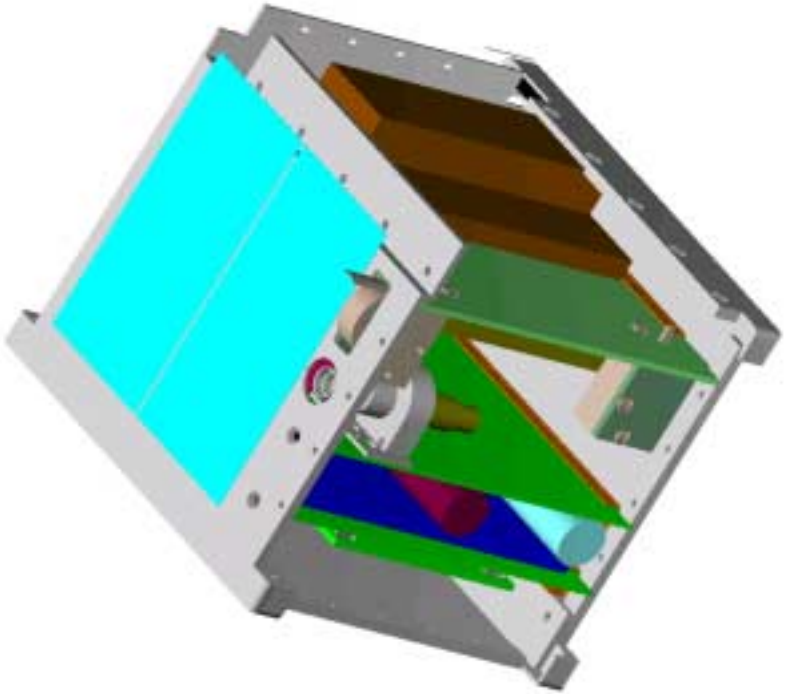
- Passive magnetic two-axis stabilization
  - Magnets + Damping = Stabilization
  - 1 HyMu 80 damping rod (parallel to **B** axis)
  - Neodymium iron boron (NIB) magnets



- Stability through Van Allen Belts
- Stability over Bozeman
- No effect on experiment







MEROPE Assembly

Mass Budget Overview

	Mass (g)
Payload	44.50
Computers	60
Communications	153.40
Power	202.15
Structure	272.00
Thermal	23.70
Attitude	200
TOTAL	955.75

Special Thanks

Please visit us online at

http://www.ssel.montana.edu/merope

and send your name into space!

For more information, questions, or comments, contact Mike Obland at:

obland@physics.montana.edu