Missouri S&T Satellite Team (M-SAT)

Presentation to the Student Satellite Panel

Great Midwestern Region Space Grant Meeting

September 16, 2010

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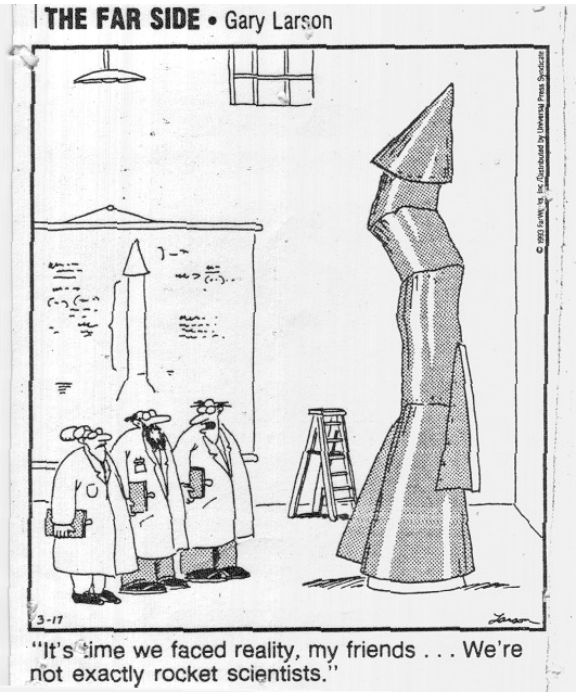
Design Education Philosophy



- History
  - Taught at San Jose State 1990-2001
  - Joined Missouri S&T Fall 2001
  - Hired to enhance spaceflight curriculum
  - Established Space Systems Engineering lab 2002
  - Senior design split into aircraft and spacecraft

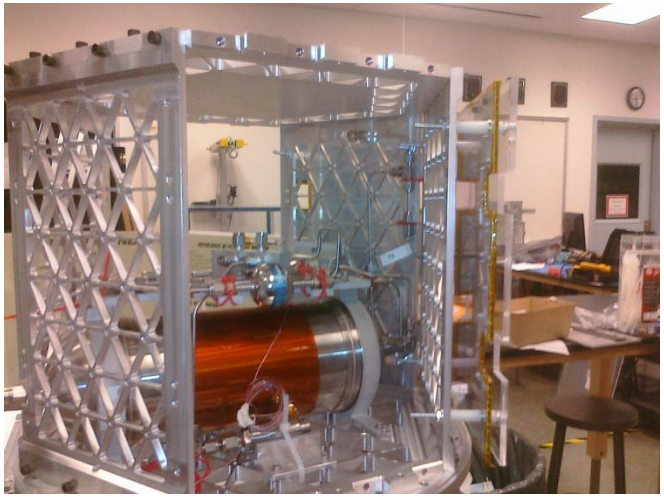
- Spacecraft Senior Design
  - Typically "paper" studies
  - Difficult to motivate students
  - While at San Jose State developed microsatellite design/build project (funded by Lockheed)

- Established MR SAT (now M-SAT) Project in 2002
  - Primary goal: capability to design and build "flight-ready" microsats
  - Goal is to orbit, but just getting spacecraft flight-ready achieves much
  - Involve Freshman to Ph.D.s, AEs, EEs, CompEs, CompSci, MEs, other faculty
  - Industry/government/academe partners

Design/Build/Fly Approach

- Teaching or Research Endeavor?
  - Want more than just a “BeepSat”
  - Focus around grad students and senior design class
    - Grad students do “in-depth” enabling research
    - Seniors have many leadership positions
  - Faculty need papers/funding for their time investment

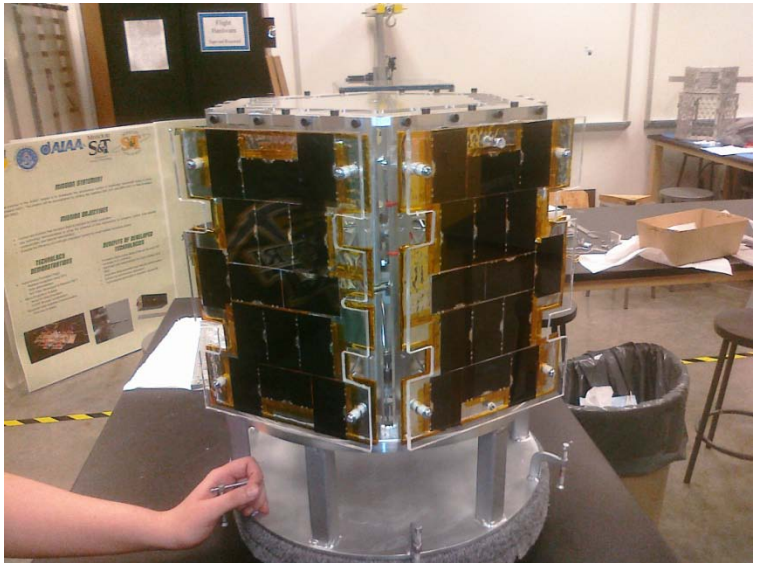
- M-SAT Team Focus Points
  - Student-run
  - Emulate industry practices
  - Teach systems engineering concepts
  - Teamwork/individual design and analysis
  - Oral and written communication
  - Numerous design reviews
  - Fundraising/proposal writing
  - K-12 outreach



Successes/Challenges

- Highlights/Successes
  - Student competitions (Nanosat 4/6, Small Sat conference winners,...)
  - Journal papers/theses
  - NASA Vomit Comet flights
  - Student post-graduation employment

- Challenges
  - Funding
  - Grad student support
    - Missouri Space Grant helps here!
  - Launch opportunities
  - Assigning grades
  - ITAR/citizenship
  - Design/Build/Fly life cycle
  - Providing enough “design” opportunities for all

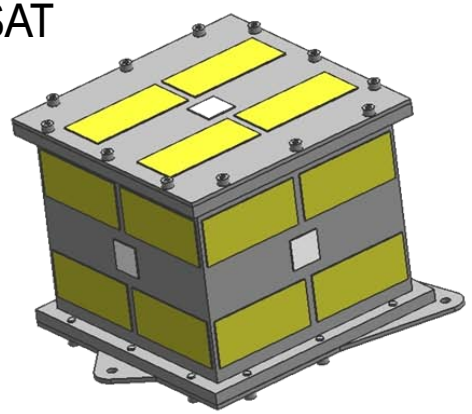


What We're Doing: Mission Overview

Mission Statement

- The purpose of the M-SAT project is to investigate the autonomous control of distributed spacecraft flying in close formation. The mission will be accomplished by orbiting two satellites (MR SAT and MRS SAT) in free formation flight.

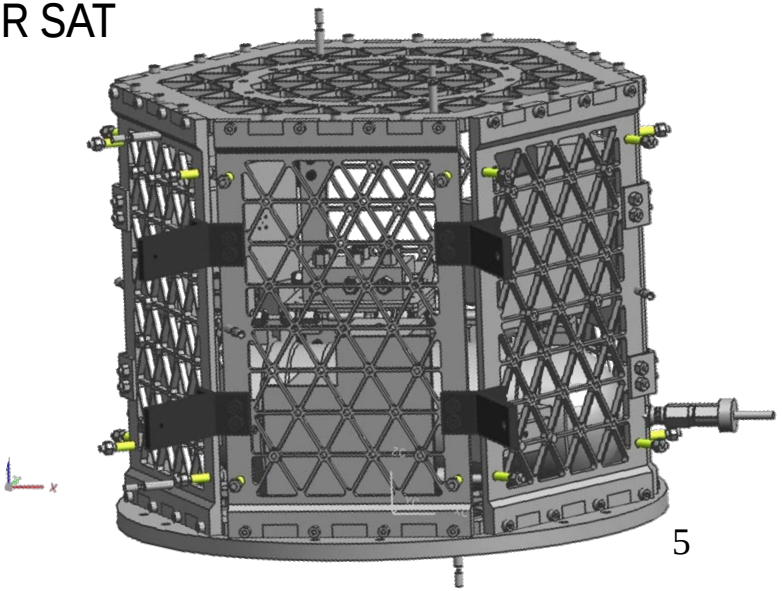
MRS SAT



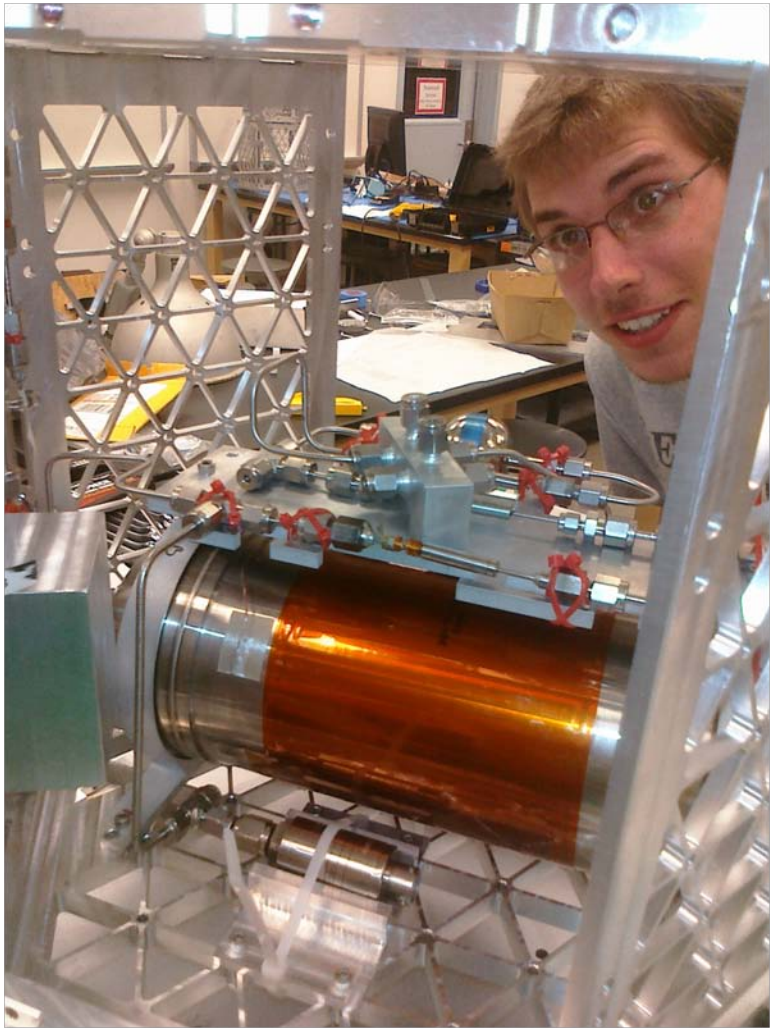
AFRL's University Nanosat Program

- Competing in the Nanosat 6 competition
- Conundrum: Mission must "foster research in enabling technologies for nanosats," while at same time:
  - Spacecraft must launch with batteries dead
  - No pressure vessels greater than 100 PSIA
  - Flight-ready spacecraft in two years
  - Deployed mechanisms discouraged
  - Must use NiCd batteries

MR SAT



Questions/Discussion?



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