Motivating a future workforce: How to run a Cubesat class at a university

Chad Carlson, Kevin Bassett, Alex Ghosh, John Warner, Prof. Victoria Coverstone, Prof. Gary Swenson

University of Illinois at Urbana-Champaign

Cubesat at the University of Illinois

ENG 491CU was organized in fall 2001.

ION1 was lost in the DNEPR launch

Illini Sat bus development begins

2001 2006 2007

To date, over 150 students have been involved

Students from AE, ECE, ME, CS, and GE have all participated

Cubesat as curriculum

- Motivation: ABET accreditation require "Interdisciplinary Engineering" projects
- Course objective: To provide a design experience in a systems type project with interdisciplinary engineering

Cubesat as curriculum

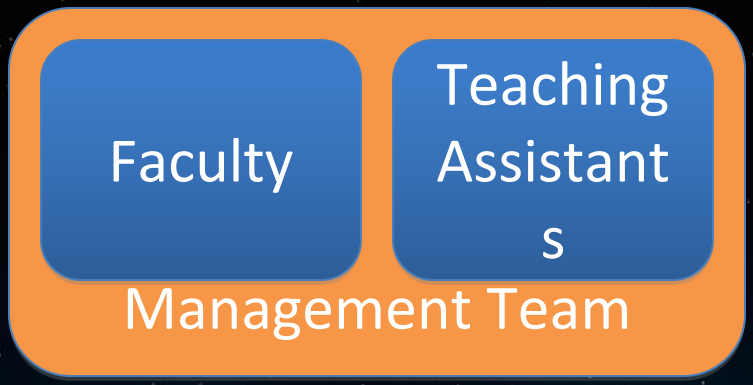
- Cubesat is a great way to teach large system engineering with a small interdisciplinary design.

Small Projects

Cubesat

Large Projects

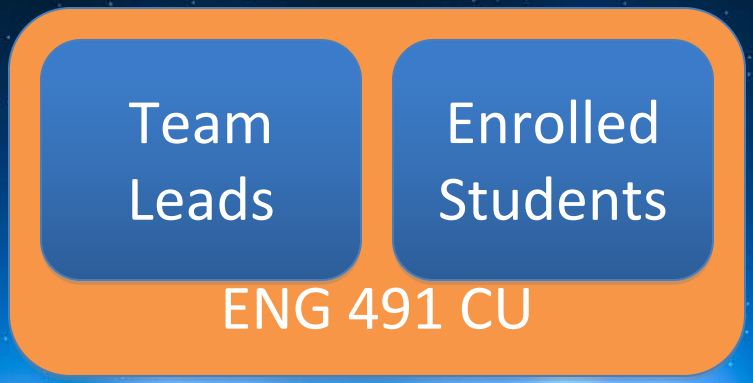
Course Management



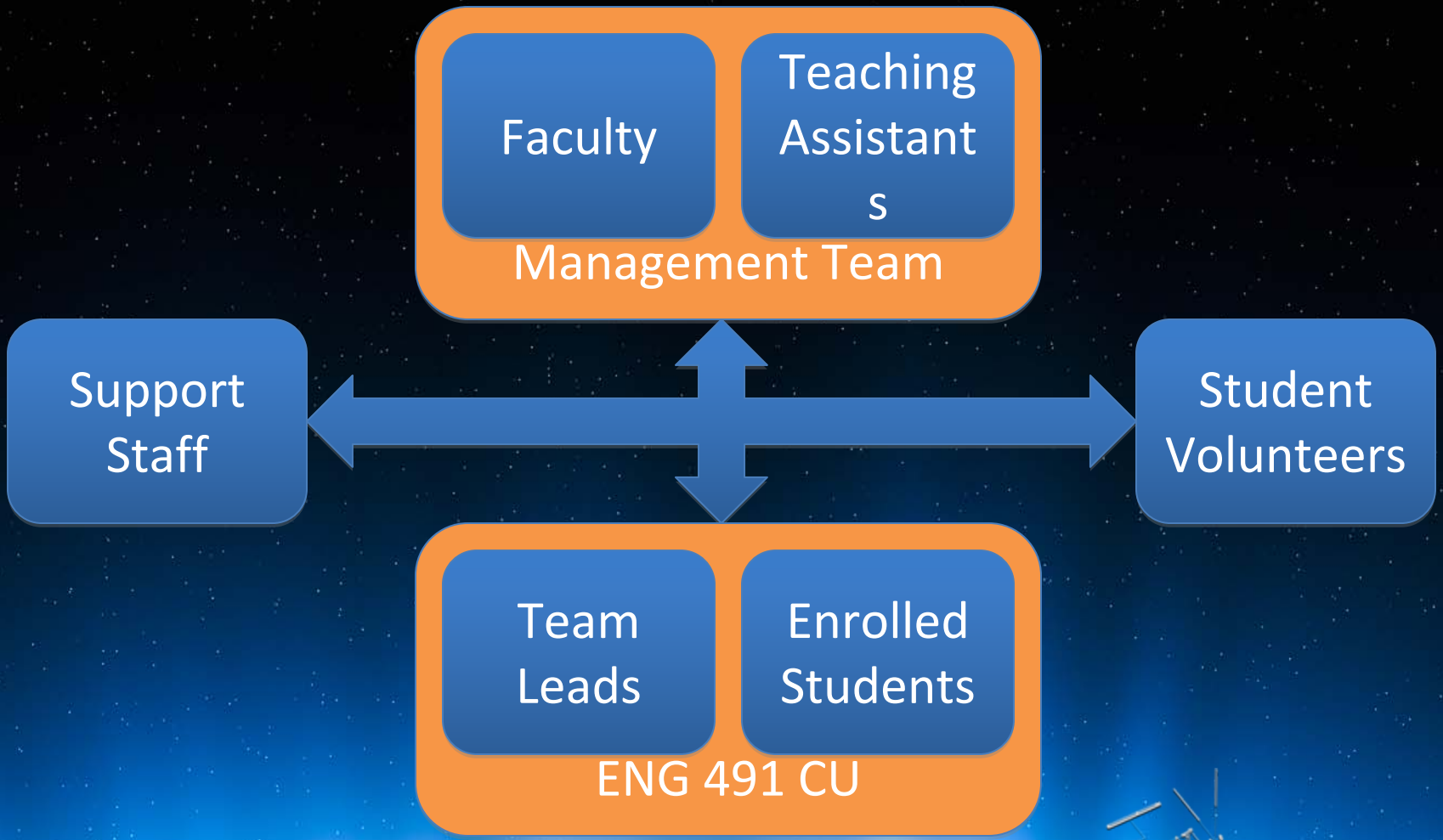
- One AE professor and one ECE professor serve as course directors and mentors
- The University supports 2 50% or 4 25% TA's each semester
- The management team has weekly lunch or conference meetings to plan for class and review team progress
- Sets goals for the semester and keeps everything moving forward

Course Management

- 3-6 students per team
- Teams include command and data handling, power, payload, communications, attitude determination and control, and structures
- A team lead is selected who serves as a liaison/spokesperson
- Each student is responsible, i.e. has ownership over their part of the project



Course Management



Course Organization

- It's a laboratory class
- One hour class per week
  - 10 min. announcements
  - 20 min. lecture
  - 30 min. action item tracking
- One hour team meeting per week outside of class with TA

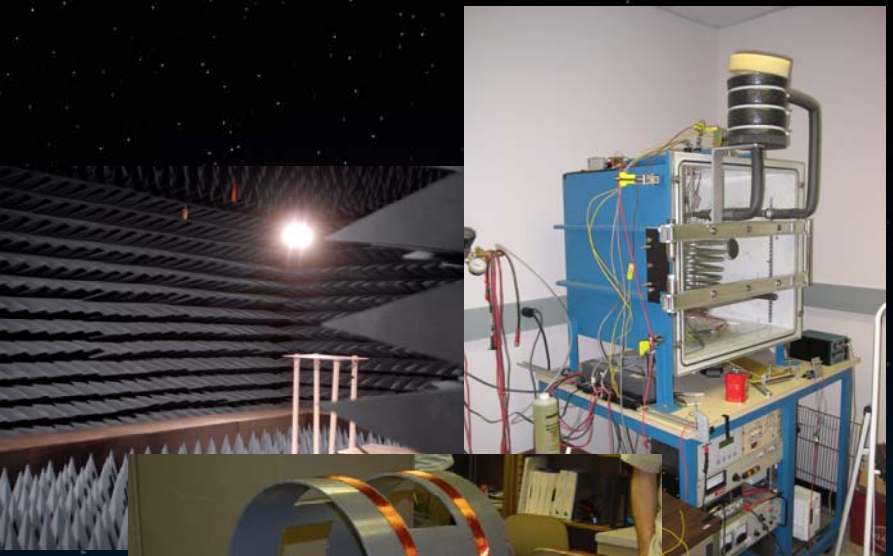
Part of Spring 2009 class

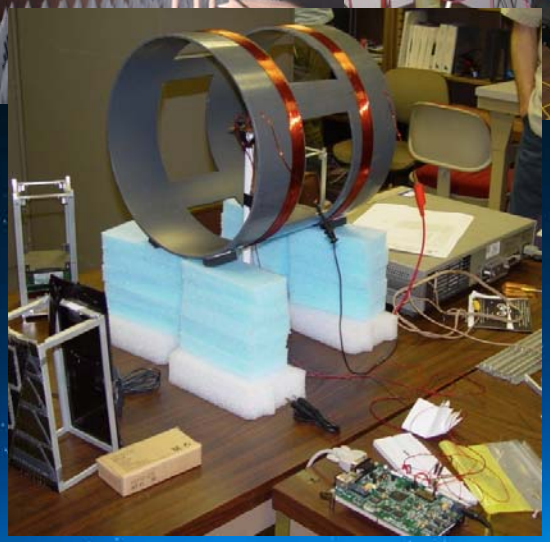
Course Evaluation and Deliverables

- Proposal (10%)
- Design Review (15%)
- Demonstration (25%)
- Oral Presentation (10%)
- Final Report (40%)

- Evaluation sheets filled out by TA's and faculty
- Evaluations are heavy on lab fabrication and testing

Facilities at U of I





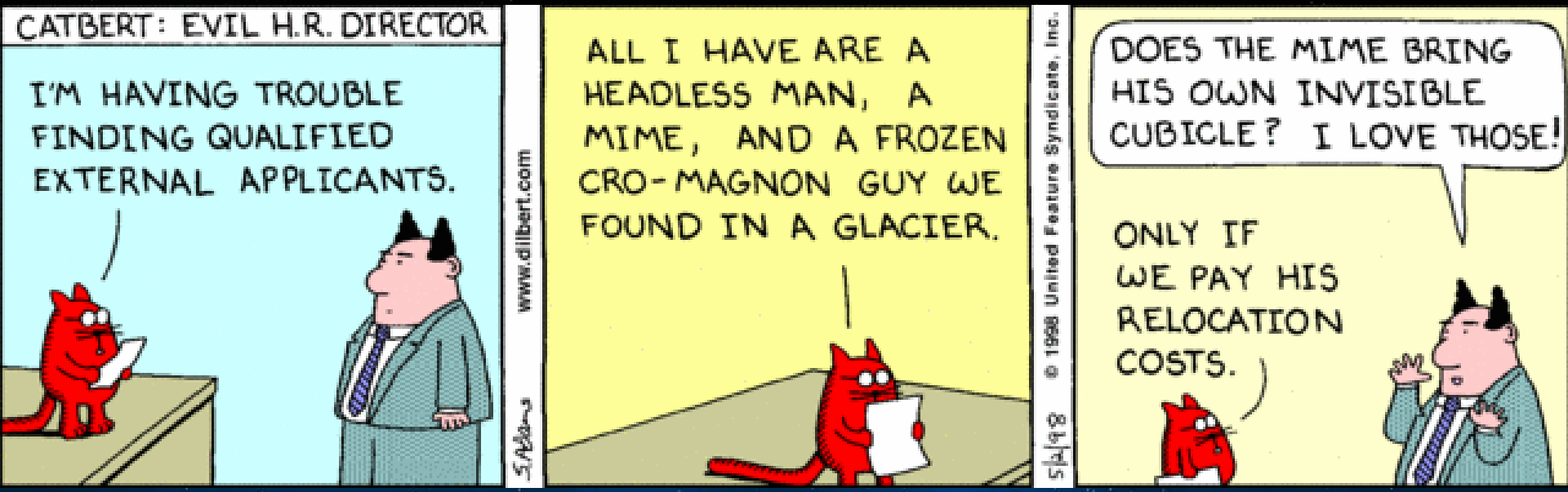
- Hardware lab with a small cleanroom, soldering station, thermal vac chamber, and 4 instrumented benches
- Software lab with 8 workstations for simulation and solid modeling
- Ground station for tracking and communicating with satellites
- Campus facilities include an electronics shop and two machine shops for fabrication.

Challenge 1: Communication

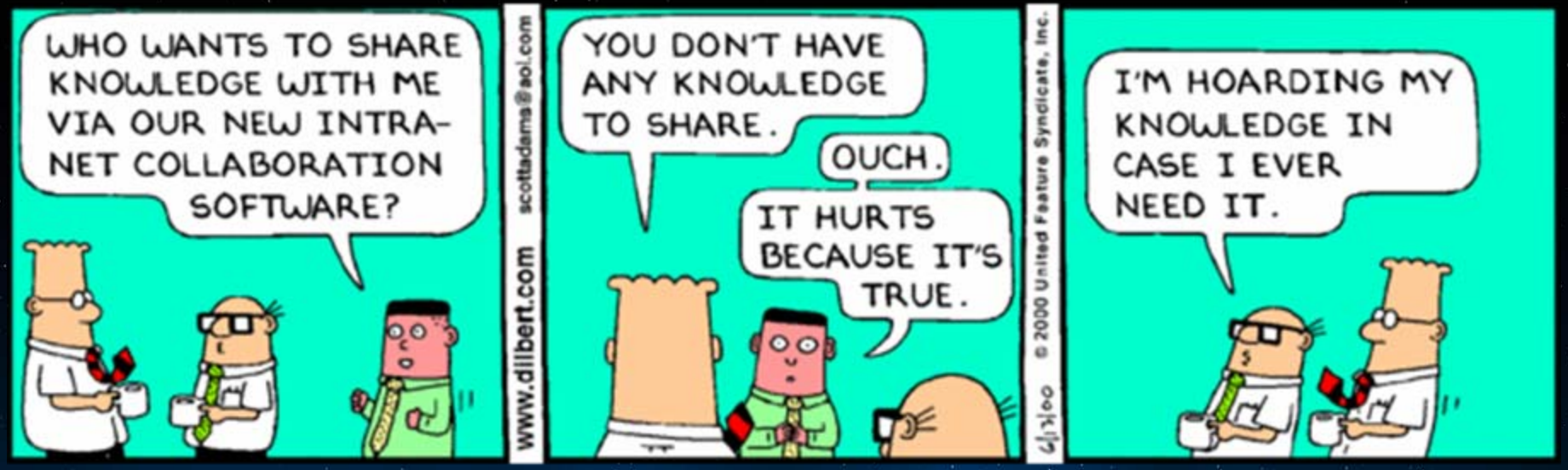
What students tell one another

What students tell the staff

Challenge 2: Recruitment



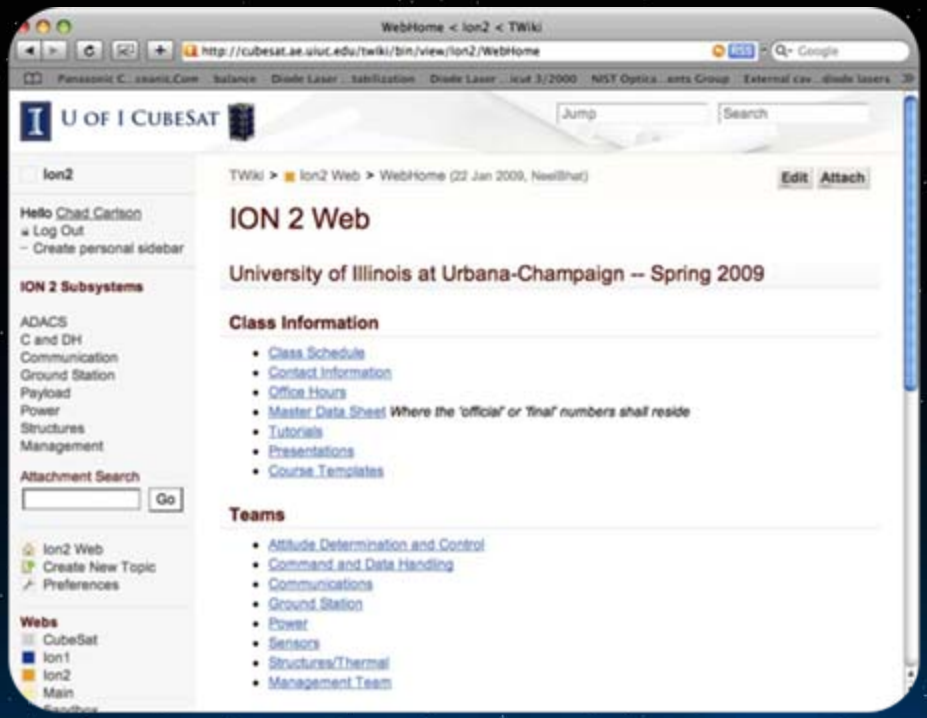
Challenge 3: Knowledge Transfer



New students are always excited to jump in, but there is a learning curve in Cubesat

Hopefully senior students don't do this!

Our toolbox



Twiki document management

Mantis task tracking

Acknowledgements

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- The students make the work go forward!

Outline

- Cubesat at the University of Illinois
- Why Cubesat was made part of the curriculum
- Course management, organization, and facilities
- Our toolbox for success – Effective reporting and communications