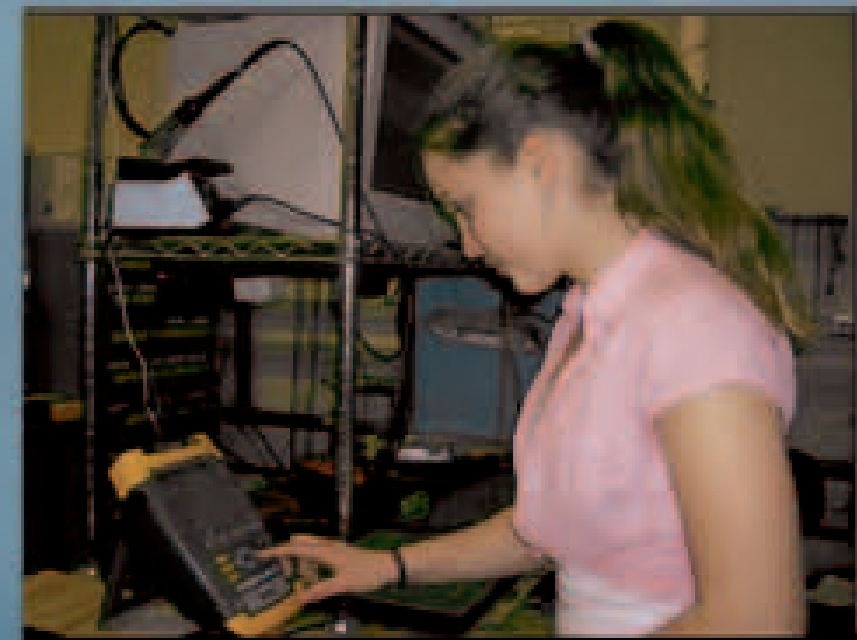
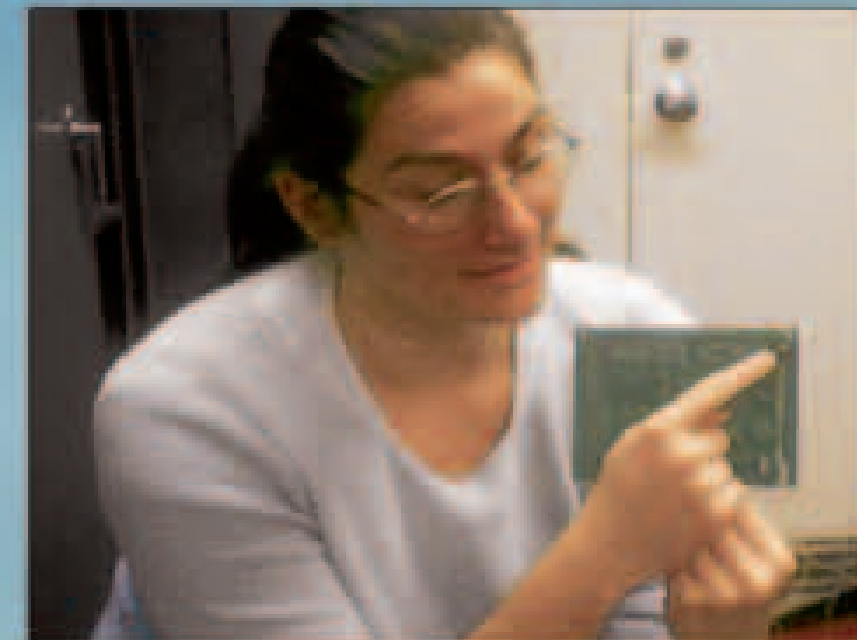




The Student Space Systems Fabrication Laboratory: An Approach to Space Systems Engineering Education



Thomas Liu, Christopher Deline, Rafael Ramos, Steven Sandoval, Ashley Smetana,
Prof. Brian Gilchrist, Prof. Peter Washbaugh, Prof. Nilton Renno



What is S3FL?

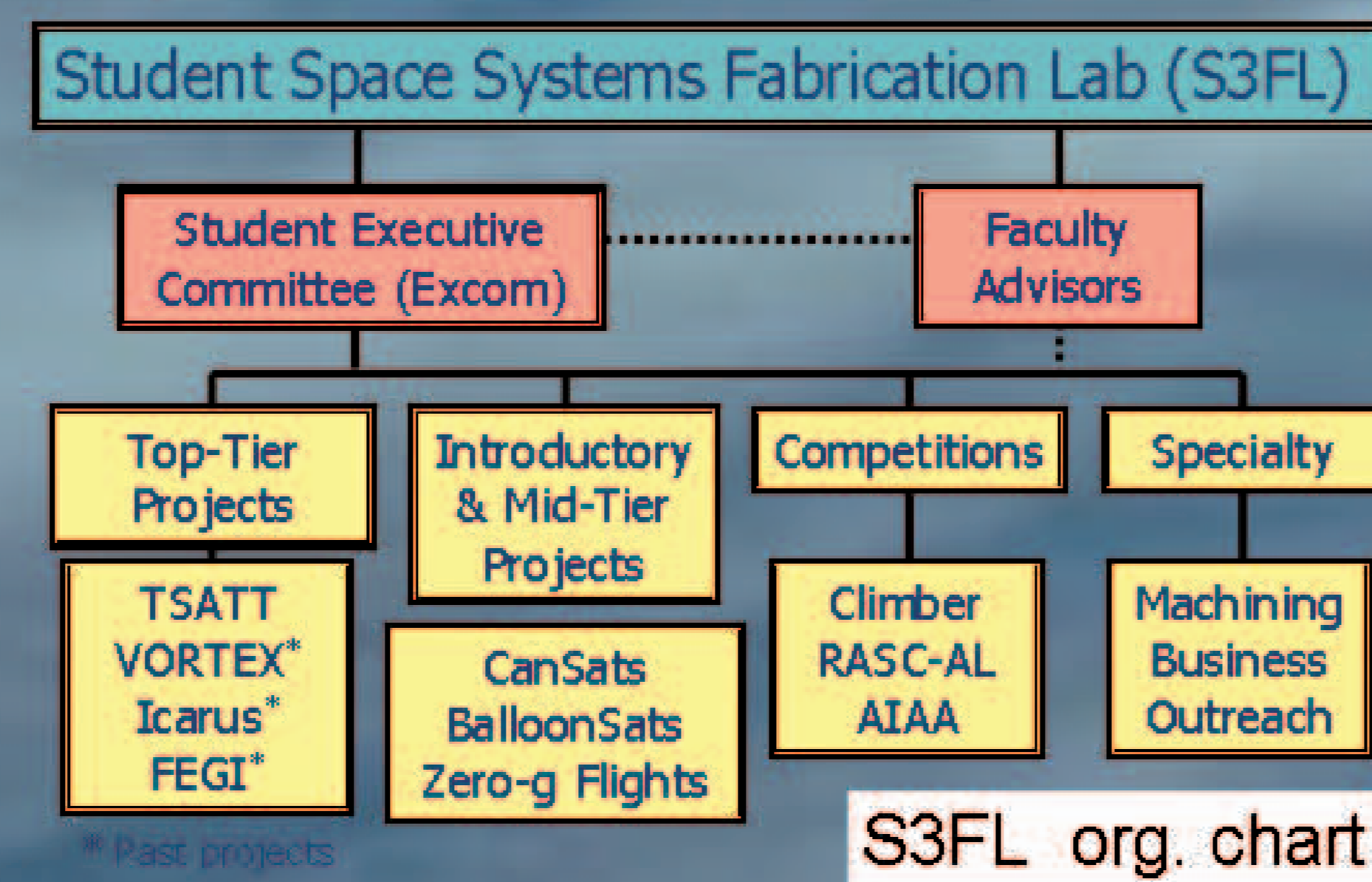
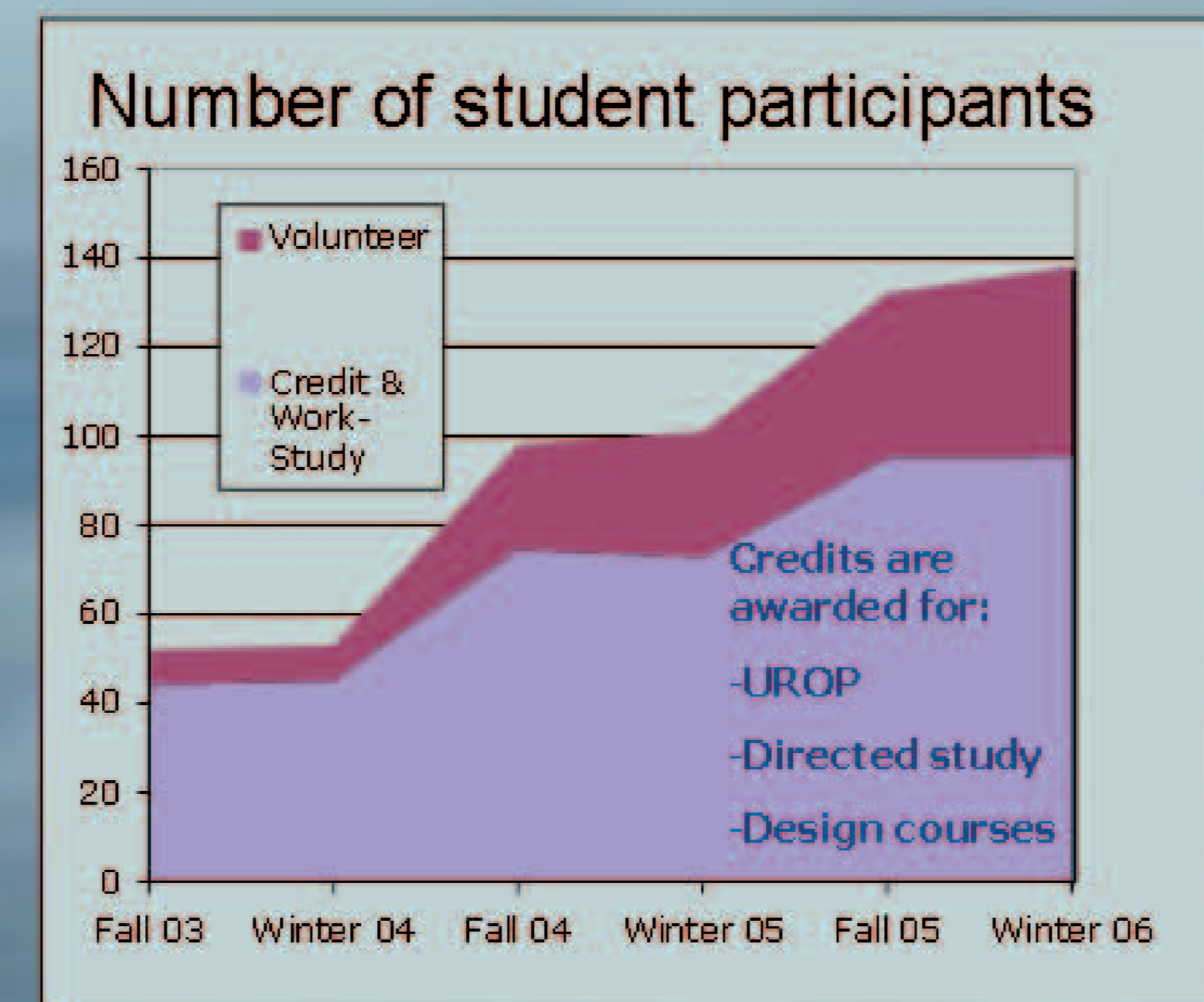
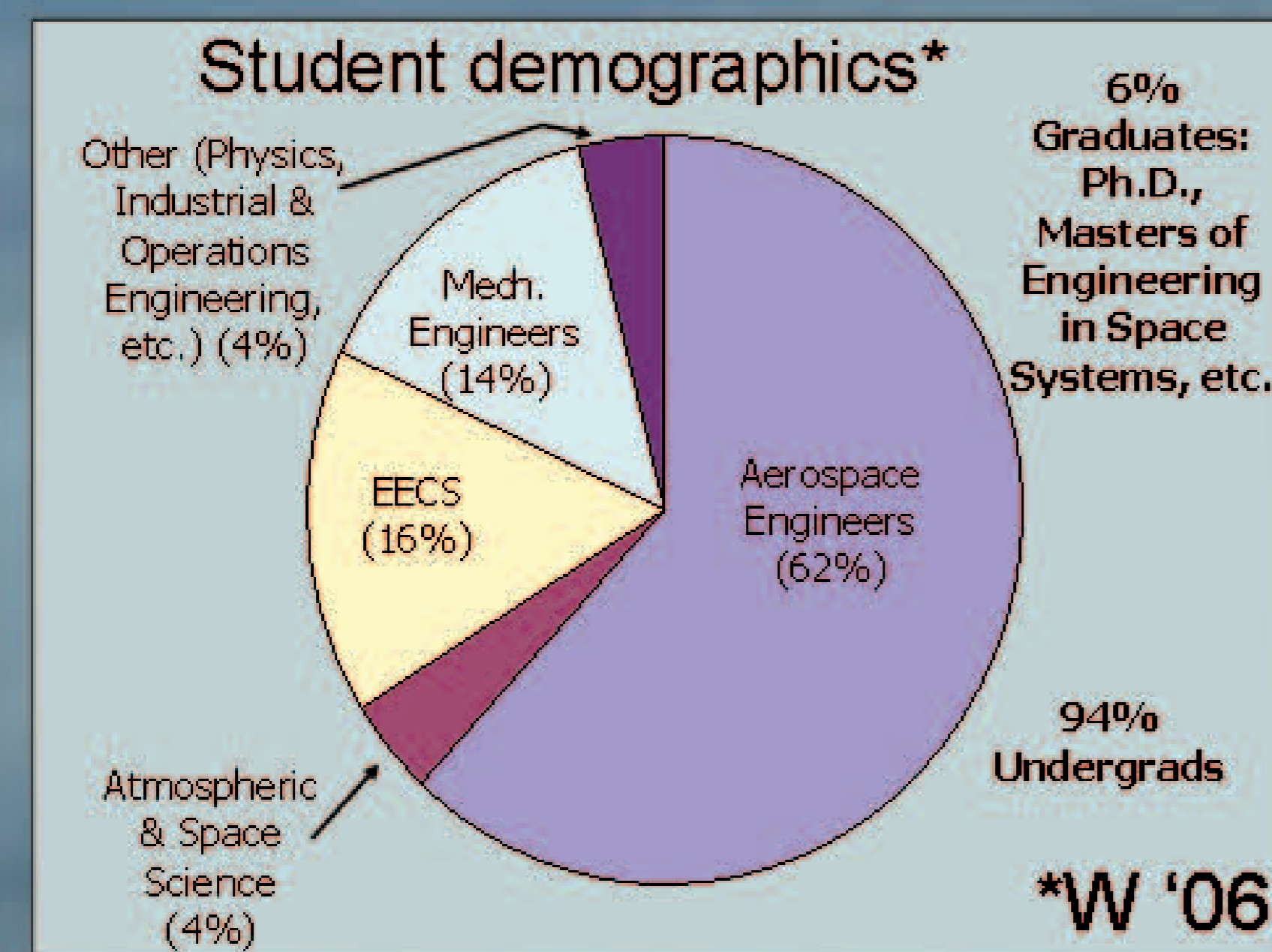
S3FL is a student-led organization at the University of Michigan dedicated to providing students with practical space systems design and fabrication experience not readily available through the usual academic curriculum. S3FL's approach is to enhance education by coupling classroom knowledge with practicum experience involving real engineering design, analysis, test, fabrication, integration, and operation of actual flight vehicles and space payloads.

Each year, S3FL chooses to pursue several projects related to space exploration and development, focusing on those requiring real hardware. In recent years, design and flight hardware competitions, NASA payloads, and collaborative spaceflight efforts have all provided outlets for S3FL students' creativity and energy.

S3FL involves over a hundred students each year on its projects, frequently teaming with external schools and sponsors.

Organization

All S3FL day-to-day activities are student-run, with leadership roles (team leads and chief engineer) filled by the more experienced students. Administrative support is provided by the student Executive Committee (Excom) and faculty advisors. S3FL students are divided among the various projects based upon prior experience, field of study, and the students' interest. Occasional cross-disciplinary meetings ensure that systems-level issues are addressed by the entire team.

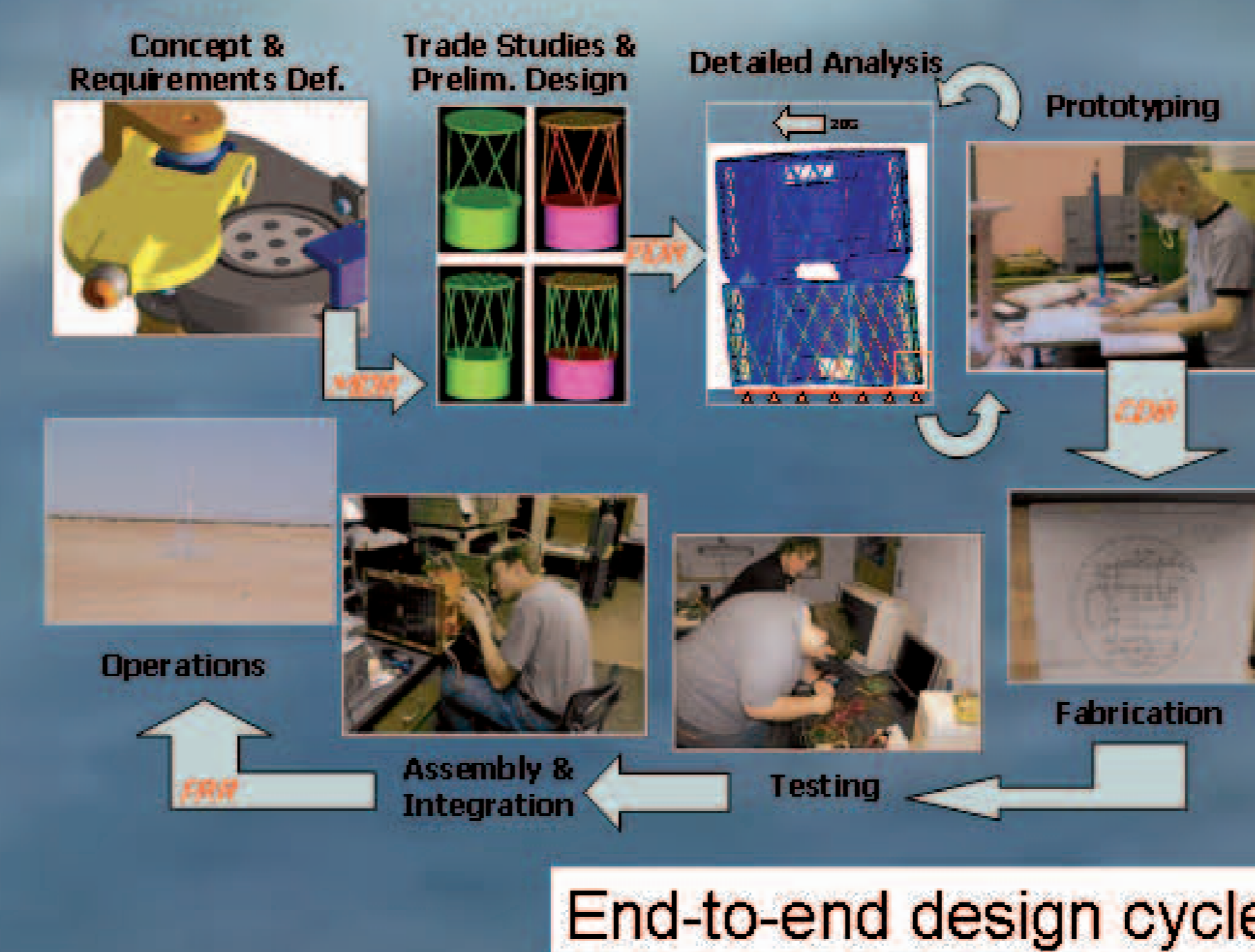


Our Philosophy

Students are attracted to S3FL by exciting and challenging projects. Unlike paper design exercises offered in a classroom setting, S3FL projects face real constraints imposed by limited funds, external deadlines, and shifting requirements. The interdisciplinary nature of these projects also requires communication between teams. This motivates S3FL students to become team players and think of the systems level impact of their designs. Along with technical skills development, S3FL projects thus better prepare students for the real tasks and problems they are likely to face upon entering the workforce.

S3FL provides:

- Hands-on projects to apply classroom knowledge in **real world, interdisciplinary settings**
- Experience working through a **complete design cycle**
- Development of **systems engineering mindset**



S3FL's core values:



Also, by participating in the end-to-end development of complete space systems, students acquire knowledge and expertise during all steps of the process from requirements definition to design and test to operations and launch.

Finally, the active leadership of upper-level students as mentors and team leads enables the transfer of knowledge to incoming students while reinforcing basic principles to the mentors. This "see one, do one, teach one" paradigm benefits all students in the program.

These methods combined are what make graduating S3FL students **wiser** engineers!

Past & Present Projects:



VORTEX 1996 - 1998



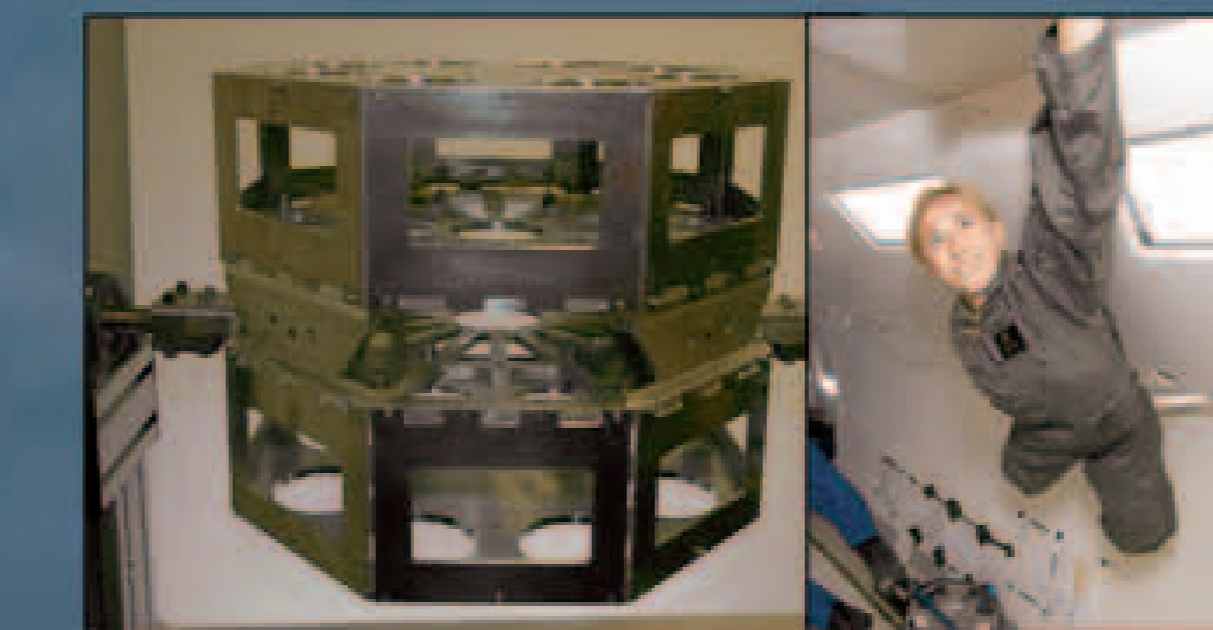
ICARUS 1998 - 2001



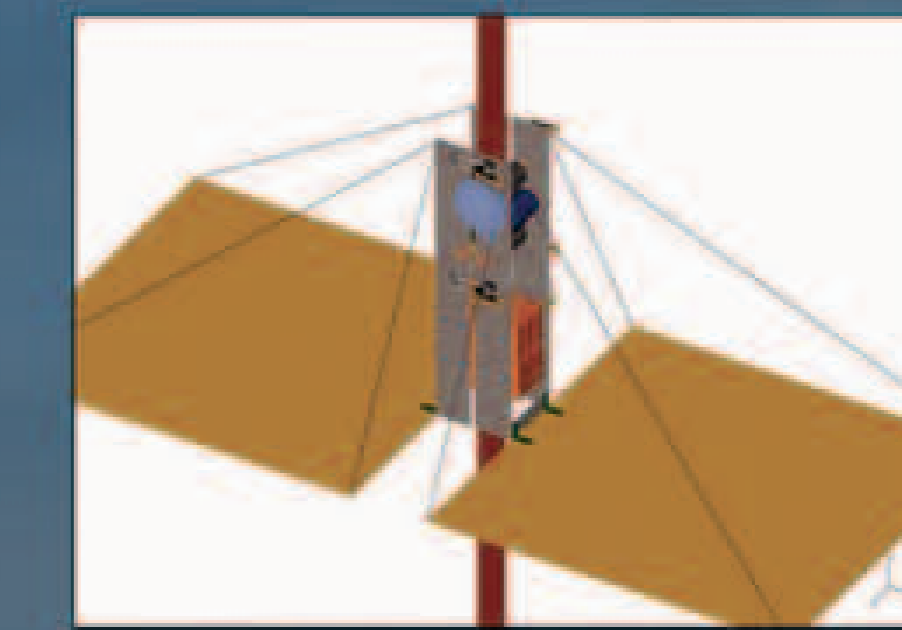
FEGI 2002 - 2005



BalloonSat 2003-2004



TSATT / C9 2005-2006



Climber 2005-2006



AND MORE!!