The Student Space Systems Fabrication Laboratory: Enhancing Space Systems Engineering Education

Student Space-Systems Fabrication Lab

http://aoss.engin.umich.edu/s3fl






What is S3FL?

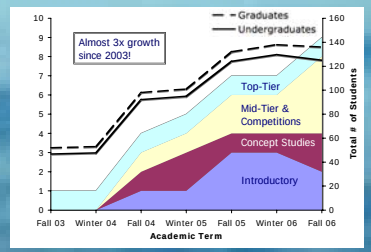
S3FL is a student-led organization at the University of Michigan dedicated to providing students with practical space systems design and fabrication experience not readily available through the usual academic curriculum. S3FL's approach is to enhance education by coupling classroom knowledge with practicum 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.

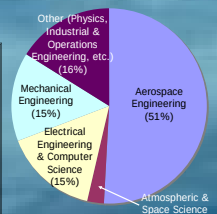
Organization

All S3FL day-to-day activities are student-run, with leadership roles (team leads and chief engineers) 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' interests. Cross-disciplinary meetings and design reviews ensure that systems-level issues are addressed by the entire team.

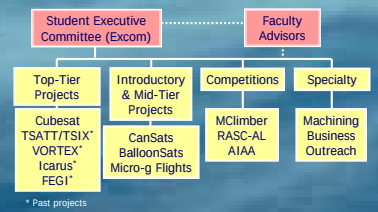


2006-2007 Demographics

- Credit-based (74%)
  - UROP
  - Project experience
  - Directed study
  - Major design
  - Work-study
- Volunteer (26%)

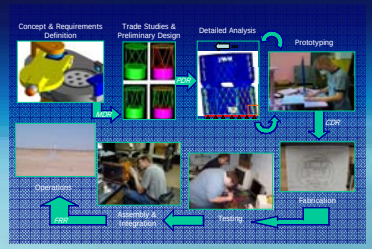


Student Space Systems Fabrication Lab (S3FL)

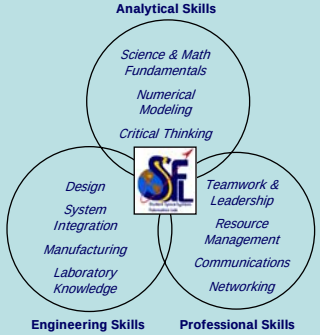


Our Philosophy

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 inter-disciplinary 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's Core Values



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

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 flight operations.

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. S3FL also runs outreach programs to provide elementary and middle school students with "beyond the formal classroom" learning experiences to encourage them to pursue further studies in engineering and the sciences.

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

Challenges persist with sustaining a growing lab, accommodating student turnover, and securing external support. Student dedication, enthusiasm, and ingenuity are called upon to address these challenges.



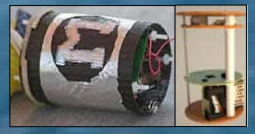


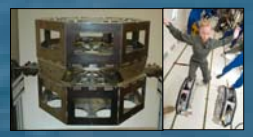


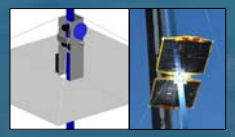
VORTEX 1996 - 1998


ICARUS 1998 - 2001


FEGI 2002 - 2005


CanSat 2004-2007


TSATT / C9 2005-2007


MClimber 2005-2007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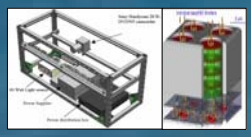
C9-nanoBLUE 2006-2007