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# The Creation and Impact of Corporate Mentorship on Student-Led Satellite Projects

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# US Educational Challenges

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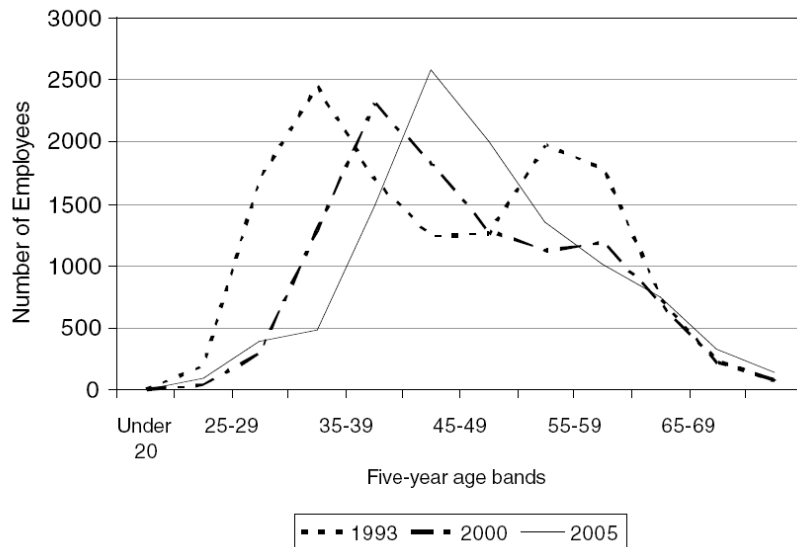


- The US faces a series of economic and educational challenges
- Rise Against the Gathering Storm Report:
  - Released by Congress in early 2006
  - An economic assessment of the US in STEM\* related fields
  - States that “technological building blocks critical to our economic leadership are eroding at a time when many other nations are gathering strength”
  - Attributes partial cause on the US educational System
  - Calls for funding incentives and engineering projects to ensure that the US is the “most attractive setting in which to study and perform research”
- Small Satellites
  - The Small Satellite industry has a responsibility to foster student development in STEM related fields by providing real-world, hands on opportunities.

\* Science, Engineering, Technology, and Math



## Average Age of NASA Employees at Three Separate Periods<sup>1</sup>



### • Is NASA to Blame?

- No: NASA is being asked to do too much with the resources allocated by congress

- NASA funding on education is eroding at a time when young engineers are a small percentage of the industry
- NASA Education Funding:<sup>2</sup>
  - FY04: ~170 Million
  - FY08: ~146 Million
  - FY12: 123 Million (projected)
- Student involvement projects have been scaled back:
  - Shuttle GAS program
  - Sounding rocket opportunities

1-Building a Better NASA Workforce: Meeting the Workforce Needs for the National Vision for Space Exploration, National Research Council, 2006.

2-NASA Budget FY04, NASA Budget Request FY09



## Solution – Corporate Mentorship



- The Colorado Space Grant Consortium links student spacecraft teams with corporate mentors
- Connections are established at the very beginning of projects



Poti Doukas, Instar Engineering Solutions



Dan Hall, First RF Corporation

- Results show:
  - Improved technical quality of student projects
  - Job satisfaction for students, mentors, and educators
  - Increased excitement for students, educators and mentors



# The DANDE Case Study

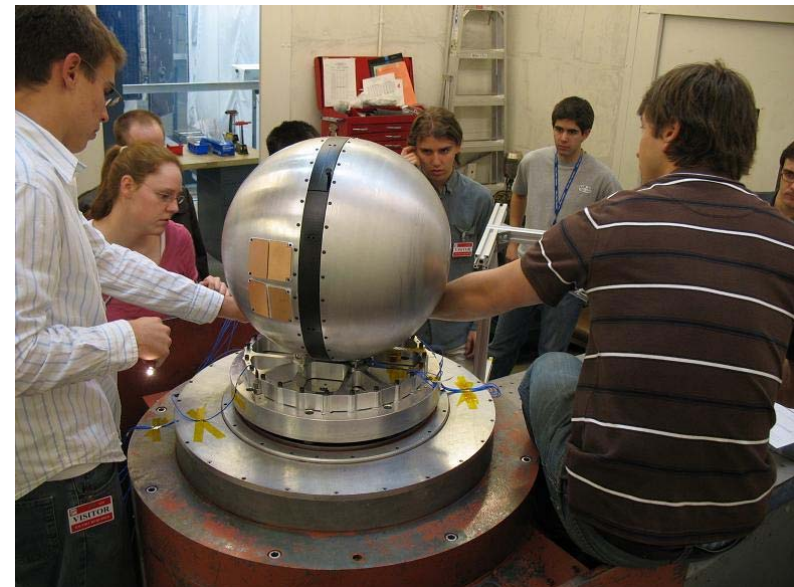


## Setup:

- DANDE is a 2-year UN5 satellite project with unique engineering challenges
- Mentorship was integrated into the mission design process during the proposal and phase A developmental stages
- Each subsystem is paired with at least one industry mentor
- Periodic contact with mentors is tracked

## Results:

- System requirements and mission objectives were solid from day 1
- Improved competence of the engineering design team
- High fidelity satellite design
- Flowdown of knowledge to other student projects
- DANDE currently has 20 tracked mentors



Vibration Test at Ball Aerospace, Boulder CO



# The DANDE – SpaceDev Relationship



- SpaceDev (Starsys)
  - Entrepreneurial space systems company
  - Designs and manufactures space system mechanisms and actuators
  - Offices are located near CU-Boulder
- Relationship established during proposal stage
  - SpaceDev engineers met with students on a monthly basis
  - An agreement was established to provide mechanisms for the DANDE mission
  - The DANDE mission will be establishing flight heritage for the mechanism design



Bryan Helgesen, AJ Hoyt, SpaceDev Corporation



# Mentorship benefits to Students



## Mentors:

- Help set achievable goals
  - Requirements!
- Provide expert help in difficult domains
- Provide exposure to effective, real-world working practices
- Keep students on schedule with deadlines and deliverables
- Are a source of career support and advice
- Inspire students to pursue space-related careers



Barry Rayhill, Ball Aerospace



# Benefits to Corporate Mentors



Working with students provides:

- Exposure to future employees
- Opportunities for product testing (TRL improvement)
- Increased morale and professional development
- Corporate networking
- Availability of student testing opportunities
- An opportunity to give back to the community and next generation



Jim White, EyaSat Corporation



James McDonald, First RF Corporation



## Lessons learned at COSGC

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- Integrate mentorship from the beginning of a project
  - Mentors are more likely to help with later problems if they had a say in the original design
  - Early buy-in builds long-term commitment to a project
- Students are understandably forgetful
  - Educators should facilitate the search for mentors and monitor the student-mentor relationships.
  - Have you called your mentor lately?
- Students should take their mentor's advice to heart
  - Ignoring advice or modifying instructions can sour a student-mentor relationship
- Mentors are busy people
  - Meet on their schedule wherever possible
  - Have a single point of contact for each mentor to avoid repeated questions



# How to get involved



## EDUCATORS:

- Look for mentors for your projects
  - Network – talk to local engineering firms, alumni, friends-of-friends
  - Go to the top
  - Ask for expertise, not money
- Facilitate the student-mentor relationship
  - Manage the search for mentors
  - Manage the initial contact
  - Monitor the periodic contacts
  - Provide support (lunches, etc.)



## MENTORS:

- Look for student programs in need
  - Check with national programs: Space Grant, Cubesat, FIRST, University Nanosat Competition, etc.
  - Check with your alma mater and local schools
- Offer your specific expertise
- Get your workplace involved



# The Care (and Feeding) of Mentors: Tips for students

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- Involve mentors from the beginning of a project
  - Mentors don't like to be called in at the last minute, especially when they could have made a difference earlier
- Respect their time
  - Mentors are volunteering their valuable time; keep meetings and communications efficient
- Maintain periodic contact
  - Keep them involved and up-to-date with formal and informal reviews (lunches work well)
- Do your homework
  - Don't expect your mentor to do your work, show up knowing as much as you can
- Listen closely
  - If your mentor tells you to do something, it's probably for a good reason
- Thank them
  - A letter to them (and their boss), plaques, lunches, etc. are always appreciated



Bryan Helgesen, SpaceDev Corporation



# Herding Cats: Tips for Mentors



- Push your students
  - Don't be afraid to make schedules, assign tasks, and hold your students accountable
- Be honest with them
  - If a design appears risky, be sure to inform your students of that, and explain why
- Give students the big picture
  - Tell students how their work fits into the rest of the system, especially business aspects
- Help cultivate character and good engineering practices
  - Be a role model of honesty, self-discipline, hard work, and teamwork.



Tim Flaherty, LASP



## Conclusion



- The Small Satellite industry has a responsibility to foster student develop in STEM related fields by providing real-world, hands on opportunities
- The next generation of engineers needs to be trained now
- NASA has less money available for education
- Individuals and Corporations can step up to the plate
- Everybody: students, mentors, the industry, wins!



## Get involved!

Much more is in our paper (SSC08-XII-5)  
Feel free to contact us with questions and comments