Applying University Small Satellite Program Lessons to a Career in the Aerospace Industry

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Meet the Authors

- Authors investigate the professional relevance of the UNP from three perspectives:

  - **University Principal Investigator:** Mason Peck
    - Cornell University Associate Professor
    - Former UNP PI (CUSat and Violet)

  - **Student Participant/Early Career Professional:** Tricia Hevers
    - Former CUSat Program Manager and ADCNS Lead
    - GN&C Engineer at Boeing Satellite Systems: August 2012

  - **Industry Program Manager:** Erik Daehler
    - Senior Manager for small satellite businesses at Boeing
    - Launched the Phantom Phoenix and 702SP
Presentation Overview

- **Background:**
  - Cornell University Satellite (CUSat) team
    - Launching in 2013
    - Program Manager and ACS Lead
  - Boeing Space & Intelligence Systems:
    - August 17th, 2012
    - GN&C and Systems Engineering

- **Goal: The UNP is:**
  - New approach to student education
  - Stresses experiential learning
  - Next generation engineering leaders

- **Lessons learned as applied to industry:**
  - Technical challenges
  - Leadership
  - Communication
University Nanosat Program (UNP)

- **American response to the demographic cliff**
  - 15% of the workforce is eligible to retire
  - Grow to **55%** in the next 10 years
  - < 5% of undergraduate degrees in engineering fields

- **Sponsored by:**
  - American Institute of Aeronautics and Astronautics (AIAA)
  - Air Force Research Laboratory (AFRL)
  - Air Force Office of Scientific Research (AFOSR)
  - National Aeronautics Space Administration (NASA)

- **Primary Objective:** Improve the (undergraduate) educational approach to build a stronger workforce right out of school

- **Participation:**
  - 28 universities
  - 4500 undergraduate students
UNP Competition

- **Compete:**
  - 10-13 universities (per cycle)
  - aggressive 2 year design cycle

- **Demonstrate:** progress on a problem of immediate technical relevance to the U.S. Air Force

- **Day-in-the-life of an Aerospace Engineer:**
  - “Hands on” satellite experience
    - Design, build, and test
  - Complete 6 reviews
  - Participate in out-reach events
  - Launch!
Joining: What have I gotten myself into?

- **Participated**: sophomore year (Fall 2009) through graduate school
- **Combine**: cutting-edge technology with “hands on” learning opportunities
- **Missions**: dynamic, technically relevant
  - Developing autonomous inspection systems
  - Validating new flight hardware
  - Astro and earth science missions
- **Fast Integration**: Two year, aggressive schedule
- **High Expectations**: industry standards, professionalism

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<th>“A” Grade Criteria</th>
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<td>Mentor others so that they can become more productive, faster.</td>
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<td>Recognize that every engineering decision on a complex system like CUSat is interdisciplinary and habitually consider the impact of your decisions on other systems.</td>
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<td>Follow up with people to be sure that they give you what you need on time.</td>
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<td>Dynamically manage the schedule to pull in deadlines when work goes well or shift deadlines while accommodating the rest of the subsystems when things go wrong.</td>
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<td>Seek more responsibility rather than hoping someone else will take care of problems you notice.</td>
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Day-In-The-Life Experience

- Work every portion of the satellite mission in a 2 year design cycle:
  - Mission definition
  - Dynamics simulations
  - Mechanical and electrical design
  - Integration and testing
  - Writing software
  - Building ground stations
  - Developing ROPs
  - Performing mission operations

- Student leaders gain exposure with industry’s historical weaknesses:
  - Customer interactions
  - Project management
  - Mentoring
First Year Experiences

- Experienced professionals who possess:
  - a broad understanding of spacecraft engineering
  - Some detailed subsystem knowledge
  - Industry in-sight

- Professional networks:
  - Connect with other UNP graduates
  - Other professional networks

- Once UNP graduates enter industry:
  - Assume: greater responsibility
  - Given: more challenging work
  - Engage: in mentoring faster
  - Implement: new styles of communication
  - Easily integrate: into existing teams

- UNP experience gives new hires a distinct advantage
Value of UNP to Industry

- **Bring the experience of an engineer:**
  - Cross-disciplinary
  - Fundamental understanding
  - Faster absorption
  - Engage in mentoring

- **Transfer the latest methods and theory from universities:**
  - Wiki style documentation
  - Recruiting and bring people up to speed
  - Close physical collaboration
  - White boards
  - Reusability/maintenance
  - Maximizing standardization, minimizing the change, reduce cost
Summary

- UNP challenges traditional academic curricula by providing an experiential learning opportunity that trains the next generation of engineering leaders.

- Graduates:
  - Understand teamwork, communication, leadership
  - Cross-disciplinary experience
  - Ready to challenge the status quo:
    • Bring new technology to teams
    • Implement new methods
  - Better retention
  - Accelerated career growth

- “It’s successes are measured by the immediate and continuing contributions that alumni make to the aerospace industry and the value is reflected in companies that hire UNP graduates.”
Thank You

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