TSL Info Session

Gavin Martin | Fall 2017
Texas Spacecraft Laboratory
Lab Background
About the TSL

• Originally established in 2002 as the Satellite Design Laboratory
• Student-driven research laboratory
• Involved in all phases of the space mission lifecycle
• Collaborate with other university research groups, governmental organizations, and/or private industry to build spacecraft that perform scientific experiments or demonstrate new technologies
Past Missions: Bevo-2

- Launched in late 2015, deployed from ISS in 2016
- Goal: perform proximity operations with AggieSat4

Photo Credit: NASA
Past Missions: RACE

- Launched in 2014; rocket carrying it exploded
- Goal: create atmospheric profiles using a radiometer

Photo Credit: JPL
Past Missions: FASTRAC

- Launched in 2010, operated for several years
- Goal: perform proximity operations with two satellites
Past Missions: Bevo-1

- Launched in 2009 aboard Space Shuttle *Endeavor*
- Goal: perform proximity operations and validate NASA JSC GPS receiver
ARMADILLO
ARMADILLO Background

• Stands for Atmospheric Related Measurements And Detection of submillimeter Objects
• Winner of the Air Force Research Laboratory’s University Nanosatellite Program competition
• Manifested for launch on the first SpaceX Falcon Heavy
Payloads

- Piezoelectric Dust Detector: detect tiny debris
- FOTON GPS receiver: perform radio occultations
- Retroreflector: laser ranging experiments
Structure
Subsystem Structure

- Currently divided into five subsystems
- You’ll have the opportunity to join whichever you choose
- Mirror actual spacecraft subsystems
What Do They Do? (Pre + Post-GORR)

<table>
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<tr>
<th>ADC</th>
<th>EPT</th>
<th>COM</th>
<th>SYS</th>
<th>PAY</th>
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| • Oversee Shell ADC development  
• Learn attitude dynamics & programming  
• Become familiar with ARMADILLO ADC code  
• Design new ADC system  
• Perform trade studies of ADC hardware  
• Simulate ADC algorithms using StarBox/custom software | • Oversee Shell Power + Thermal development  
• Deliver Power Budget for GORR  
• Learn about EPS and Thermal systems  
• Develop ARMADILLO thermal model  
• Design new power distribution/regulation system given new mission constraints  
• Design/build solar panels/batteries/etc  
• Develop new thermal model | • Oversee Shell Comms development  
• All ground station activities  
• Deliver link budget & data budget for GORR  
• Track & receive from satellites  
• Design and construct new ground station  
• Develop encoding/decoding software for data TX  
• Design robust satellite comm system (S-band?) | • Oversee Shell development  
• Deliver support plan for GORR  
• Plan flight rehearsal(s) / operations procedures  
• Plan/host new student bootcamps  
• Create RVM for new mission  
• Interface hardware/software across other subsystems  
• Direct integration + testing for new satellite | • Coordinate with Baylor and RNL  
• Develop experiment planning and scheduling guide  
• Write end user's guide  
• Develop payload-related STK tools  
• Coordinate with new partners  
• ? |
Likely Subsystem additions

• Adding more subsystems after ARMADILLO’s final review in October/November
• Members will be given the opportunity to switch subsystems if a new one is more appealing
Leadership Structure

Principal Investigator
- Noble Hatten

Program Manager
- Gavin Martin

- ADC Lead
  - James Crowley

- EPS/TPS Lead
  - Alexis Zinni

- COM Lead
  - Brittany Mitchell

- SYS Lead
  - Zac McLaughlin

- PAY Lead
  - Gavin Martin
Join Us
Application Process

• **Must** be a U.S. citizen or legal permanent resident
• **Must** have completed your first year of college (no freshmen)
• Application can be found at [http://tinyurl.com/tsl-app-fall-2017](http://tinyurl.com/tsl-app-fall-2017)
  • Deadline to submit is Saturday, September 9th at 11pm
• Email your resume to ut.tsl.recruitment@gmail.com
Application Questions

• Email, EID, major, graduation date, GPA, and citizenship/residency status
• Short answer questions about:
  • Why you want to join
  • Prior project experience and what you learned + how you’ll apply it here
  • Relevant skills
  • Other commitments this semester
• Optional comments section
Desired Skills

• Programming experience: C++, Python, MATLAB, Linux
• Software experience: SolidWorks, Systems Tool Kit, Express PCB, Autodesk EAGLE, GnuRadio, Thermal Desktop
• Hardware experience: soldering, wiring, machining, amateur radio, etc.
• Technical writing is important
• “Soft” skills: leadership, collaborative spirit, reliability, self-motivated, curious
Decisions + Afterwards

• We will review applications and email everyone with a decision early the following week
• If you aren’t accepted, we’d love to see you build your skillset and apply again in the future
• If you are accepted:
  • You’ll be expected to fill out paperwork to get you access to TSL platforms
  • You’ll be expected to attend “bootcamps” as part of the onboarding process
Bootcamps

• Bootcamp part 1: Saturday, September 16th OR Saturday, September 23rd (11am – 2pm)
• Bootcamp part 2: Sunday, September 17th OR Sunday, September 24th (11am – 3pm)
• All accepted members must attend one Bootcamp 1 and one Bootcamp 2
  • We are giving options to accommodate people’s schedules
  • No UT football conflicts!
Questions?