

David Gerhardt

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CV last updated March 25, 2017

Professional Experience Summary

- Oct 2016 - **Systems Engineer**
present Planetary Resources, Redmond, WA

- Mar 2014 - **Systems Engineer**
Apr 2016 GOMX-3, GOMX-4A/B, and other CubeSat missions
GomSpace ApS , Aalborg, DK

- Aug 2009 - **Systems Engineer**
Jan 2014 Colorado Student Space Weather Experiment (CSSWE) CubeSat Mission
University of Colorado, Boulder, CO

- Aug 2008 - **Teaching Assistant**
May 2009 ASEN 2002 Thermo-/Aerodynamics & ASEN 2003 Dynamics
University of Colorado, Boulder, CO

- Aug 2007 - **Sensors Team Lead**
May 2008 Magnetic Investigation of Luna High-Altitude Balloon Mission
Virginia Tech, Blacksburg, VA

- Jun 2007 - **Student Researcher**
Aug 2007 Photogrammetric Sensing of the ARES 1-X Test Rocket Upper Stage Separation
NASA Langley Research Center, Hampton, VA

- Aug 2006 - **Undergraduate Researcher**
May 2007 Visual Vector Attitude Sensor for a Tabletop Satellite Simulator
Virginia Tech, Blacksburg, VA

Education

- May 2014 **Ph.D. in Aerospace Engineering Sciences**
University of Colorado, Boulder, CO

- Dec 2011 **M.S. in Aerospace Engineering Sciences**
University of Colorado, Boulder, CO

- May 2008 **B.S. in Aerospace Engineering**
Virginia Tech, Blacksburg, VA

Professional Experience

Systems Engineer – Planetary Resources, Inc.

October 2016 – Present, Redmond, WA

I'm finding myself busy with a wide range of tasks, from orbital operations planning to interplanetary trajectory design. It's a good time to be an asteroid miner!

Systems Engineer – GomSpace

March 2014 – April 2016, Aalborg, DK

For two years, I worked on various technical projects as the company grew from 10 to 40+ employees. I worked on one satellite from conception to on-orbit mission success, and many others at various points in the project lifecycle.

- Lead Systems Engineer for GOMX-3, the first ESA In-Orbit Demonstration CubeSat (3U)
 - Carried design from statement of work through in-orbit commissioning review
 - Developed and maintained requirements, budgets, technical analysis, etc.
 - Led integration, testing and operation of both EM and FM satellite models
 - Defended design at multiple design reviews with ESA management and subcontractors
 - Project declared complete success by ESA / ESTEC customer
 - Satellite remains operational; no loss of functionality after 10+ months in orbit
- Lead Systems Engineer for SEAM mission, a 3U CubeSat funded by European Commission FP7 program
 - Worked among 8 international companies to develop coherent satellite design
 - Developed requirements and overall design, defended design at various reviews
 - Led integration and test in preparation for flight (launch delayed)
- Lead Systems Engineer for GOMX-4A/B mission, dual 6U CubeSats working together in a joint Danish Government / ESA mission
 - Served as technical link between both satellites
 - Developed and maintained requirements, budgets, and technical analysis for advanced satellite project with multiple sensing / communication systems and first GomSpace propulsion experience.
 - Mentored student intern in system engineering role over 6 months
 - Defended satellite design at reviews through PDR with ESA management
- Engineering support for multiple sales team proposals
 - Technical feedback for proposals at widely varying levels of development
 - Many supported projects led to signed contracts

Systems Engineer – Colorado Student Space Weather Experiment (CSSWE) CubeSat Mission

Aug 2009 – Jan 2014, University of Colorado, Boulder, CO

Throughout graduate school, I led 60+ students through the creation and operation of a 3kg satellite for space weather investigation. The satellite surpassed all mission goals and made science measurements for 438 days, nearly 5x the full mission success duration.

- As the only student fully funded through the CubeSat, was deeply involved in each phase of the project cycle from proposal to complete mission success
- Developed and maintained satellite requirements based on feedback from mission PI
- Developed and maintained satellite budgets and risk analysis based on feedback from subsystem leads
- Led design reviews presented to professional engineers and professors twice per semester
- Designed and implemented the passive magnetic attitude control system used to orient the spacecraft on-orbit
- Planned and executed satellite integration and system testing: day-in-the-life testing, magnetometer calibration, qualification vibration testing, and TVAC testing
- Worked closely with funding agency (NSF), launch providers (NASA, ULA, NRO), and regulatory agencies (FCC, IARU) to ensure all external requirements were met
- Developed an automated commanding system for ground operations which collects data from the Boulder ground station and amateur radio operators around the world, analyzes the data to prioritize future data requests, runs passes autonomously accounting for satellite health, and provides real-time plots of downlinked telemetry
- Developed a Multiplicative Extended Kalman Filter specifically for CSSWE attitude determination
- Oversaw day-to-day on-orbit satellite operation via Boulder ground station
- Monitored satellite health and performed anomaly analysis and correction.

Teaching Assistant – ASEN 2002 Thermo-/Aerodynamics & ASEN 2003 Dynamics

Aug 2008 – May 2009, University of Colorado, Boulder, CO

- Responsible for four labs per week, each with 50+ students
- Held office hours to guide students in their understanding of the material
- Graded lab reports and exams

Sensors Team Lead - Magnetic Investigation of Luna High-Altitude Balloon Mission

Aug 2007 - May 2008, Virginia Tech, Blacksburg, VA

- Worked with 18 students to develop a payload for the High-Altitude Student Payload (HASP) Balloon Program as a senior project
- Developed a topographic mapping system using five commercial-off-the-shelf digital cameras
- Participated in system testing at NASA Wallops Space Flight Center and successful launch from Fort Sumner, NM

Student Researcher - Photogrammetric Sensing of the ARES 1-X Test Rocket Stage Separation

Jun 2007 - Aug 2007, NASA Langley Research Center, Hampton, VA

- Selected for the NASA Undergraduate Student Research Program (USRP) for the opportunity to work directly under a NASA civil servant

- Developed camera layout for 3D photogrammetric sensing of ARES 1-X rocket for real-time sensing of upcoming test flight to determine if ARES 1 upper stage could hit lower stage during separation
- Created a simulation as well as small- and full-scale physical mockups of ARES 1-X to test photogrammetric camera layout

Undergraduate Researcher - Visual Vector Attitude Sensor for a Tabletop Satellite Simulator

Aug 2006 - May 2007, Virginia Tech, Blacksburg, VA

- Worked on a team of 4 undergraduates to design & test webcam-based attitude sensor for a tabletop satellite simulator
- Developed image processing routines in C++ to calculate vertices of isosceles triangle mounted within webcam field of vision
- Developed scripts to gather and process data over a variety of attitudes in a short timespan

Dissertation

Passive Magnetic Attitude Control for Small Satellites

- Passive Magnetic Attitude Control (PMAC) uses a combination of hard- and soft-magnets to control the orientation of a spacecraft using a local magnetic field
- Presented PMAC theory and literature review of previous missions
- Measured parameters of hard- and soft-magnetic components of PMAC system
- Developed simulation to represent PMAC dynamics at a level sufficient for predictive mission planning
- Compared PMAC simulation to on-orbit results from CSSWE CubeSat

Peer-reviewed Papers

1. X. Li, S. Palo, R. Kohnert, **D. Gerhardt**, L. Blum, Q. Schiller, D. Turner, W. Tu, N. Sheiko, and C. S. Cooper, "Colorado Student Space Weather Experiment: Differential flux measurements of energetic particles in a highly inclined low Earth orbit", in *Dynamics of the Earth's Radiation Belts and Inner Magnetosphere, Geophys. Monogr. Ser.*, vol. 199, edited by D. Summers et al., 385–404, AGU, Washington, D. C., 2012, doi: 10.1029/2012GM001313.
2. X. Li, S. Palo, R. Kohnert, L. Blum, **D. Gerhardt**, Q. Schiller, and S. Califf, "Small Mission Accomplished by Students – Big Impact on Space Weather", *Space Weather*, Vol 11, 2013, doi: 10.1002/swe.20025.
3. X. Li, Q. Schiller, L. Blum, S. Califf, H. Zhao, W. Tu, D. L. Turner, **D. Gerhardt**, S. Palo, S. Kanekal, D. N. Baker, J. Fennell, J. B. Blake, M. Looper, G. D. Reeves, and H. Spence, "First Results from CSSWE CubeSat: Characteristics of Relativistic Electrons in the Near-Earth Environment During the October 2012 Magnetic Storms", *J. Geophys. Res. Space Physics*, Vol 118, 2013, doi: 10.1002/2013JA019342.

4. **D. Gerhardt**, S. Palo, Q. Schiller, L. Blum, X. Li, and R. Kohnert, "The Colorado Student Space Weather Experiment (CSSWE) On-Orbit Performance", *Journal of Small Satellites*, Vol 3., No. 1, 2014.
5. **D. Gerhardt** and S. Palo, "Volume Magnetization for System-Level Testing of Magnetic Materials within Small Satellites", *Acta Astronautica*, Vol. 127, 2016.
6. S. Nag, J. Rios, **D. Gerhardt**, and C. Pham, "CubeSat Constellation Design for Air Traffic Monitoring", *Acta Astronautica*, Vol. 128, 2016.

Conference Papers and Proceedings

1. **D. Gerhardt**, S.A. Geollner, S. Hefter, and L.J. Jones, "Visual Vector Sensor Implementation for Tabletop Spacecraft Simulators," *AIAA Region I-MA Student Conference*, National Institute of Aerospace, Hampton, VA, 2007.
2. **D. Gerhardt**, "Passive Magnetic Attitude Control for CubeSat Spacecraft," *Small Satellite Conference*, AIAA/USU, 2010.
3. S. Palo, X. Li, **D. Gerhardt**, and D. Turner, "Conducting Science with a CubeSat: The Colorado Student Space Weather Experiment", *Small Satellite Conference*, AIAA/USU, 2010.
4. Q. Schiller, **D. Gerhardt**, L. Blum, X. Li, and S. Palo, "Design and Scientific Return of a Miniaturized Particle Telescope Onboard the Colorado Student Space Weather Experiment (CSSWE) CubeSat", *35th IEEE Aerospace Conference*, 2014.
5. L. Alminde, K. Kaas, M. Bisgaard, J. Christiansen, and **D. Gerhardt**, "GOMX-1 Flight Experience and Air Traffic Monitoring Results", *Small Satellite Conference*, AIAA/USU, 2014.
6. I. Portillo, **D. Gerhardt**, M. Bisgaard, "Launch and Early Operations Phase for the GOMX-3 Mission", *2nd IAA Latin American CubeSat Workshop*, Florianopolis, Brazil, 2016.
7. J. Larsen, **D. Gerhardt**, M. Bisgaard, L. Alminde, R. Walker, M. Fernandez, and J. Issler, "Rapid Results: The GOMX-3 CubeSat Path to Orbit", *45 Symposium*, Malta, 2016.
8. **D. Gerhardt**, M. Bisgaard, L. Alminde, R. Walker, M. Fernandez, and J. Issler, "GOMX-3: Mission Results from the Inaugural ESA In-Orbit Demonstration CubeSat", *Small Satellite Conference*, AIAA/USU, 2016.
9. G. Nies, H. Hermanns, M. Stenger, M. Bisgaard, and **D. Gerhardt**, "Battery-Aware Optimal Scheduling in Low Orbit: The GOMX-3 Case", *21st International Symposium on Formal Methods*, Cyprus, 2016.

Poster Presentations

1. **D. Gerhardt**, X. Li, S. Palo, D. Turner, T. Redick, and J. Tao, "Colorado Student Space Weather Experiment: In-Situ Measurement of Solar Energetic Particles," *CEDAR Workshop*, Santa Fe, NM, 2009.
2. D.L. Turner, T. Redick, **D. Gerhardt**, X. Li, S. Palo, and J. Tanner, "Graduate Student Design of a CubeSat: the Colorado Student Space Weather Experiment", *Capstone Design Conference*, Boulder, CO, 2010.

3. S. Palo, X. Li, **D. Gerhardt**, D. Turner, V. Hoxie, R. Kohnert, S. Batiste, "The Colorado Student Space Weather Experiment: A CubeSat for Space Physics", *38th COSPAR Scientific Assembly*, Bremen, Germany, 2010.
4. X. Li, S. Palo, **D. Gerhardt**, L. Blum, and Q. Schiller, "Colorado Student Space Weather Experiment: NSF CubeSat", *NSF CubeSat Symposium*, Washington D.C., 2012.

Honors and Awards

- Aug 2010 2nd place, Frank J. Redd Student Scholarship Competition, SmallSat Conference
 May 2008 Graduated summa cum laude (B.S. in Aerospace Engineering)
 Apr 2007 2nd place Team Category Winner, AIAA Region I-MA Student Conference
 2004 - '08 Deans Honor List for 8 of 8 undergraduate semesters

Computer Skills (relative proficiency)

MATLAB	(10/10)	LabVIEW	(8/10)	LaTeX	(8/10)
Shell script	(8/10)	Simulink	(7/10)	STK	(7/10)
SolidWorks	(7/10)	Inventor	(7/10)	Linux	(7/10)
C++	(5/10)				