

PENINA AXELRAD

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Research Interests

Global Positioning System (GPS) and Global Navigation Satellite System (GNSS) technology and applications for satellite orbit and attitude determination, passive orbit estimation and relative navigation, GNSS-based bistatic radar for altimetry and remote sensing; GNSS multipath characterization and mitigation.

Education

Ph.D. in Aeronautics and Astronautics, 1991, Stanford University, Stanford, CA
Dissertation: "A Closed-Loop GPS-Based Orbit Trim System for Gravity Probe B."
S.M. in Aeronautical and Astronautical Engineering, 1986, Massachusetts Institute of Technology, Cambridge, MA, Master's thesis: "Near-Earth Orbit Determination and Rendezvous Navigation Using GPS."
S.B. in Aeronautical and Astronautical Engineering (Avionics Option), 1985, Massachusetts Institute of Technology, Cambridge, MA.

Professional Experience

2005-Present Professor, Department of Aerospace Engineering Sciences, University of Colorado at Boulder.
2008-2009 Visiting Scientist COSMIC Program Office, University Corporation for Atmospheric Research (UCAR)
2007-2008 Acting Chair, Department of Aerospace Engineering Sciences, University of Colorado at Boulder.
2005-2007 Associate Chair, Department of Aerospace Engineering Sciences, University of Colorado at Boulder.
1999-2005 Associate Professor, Colorado Center for Astrodynamics Research, Department of Aerospace Engineering Sciences, University of Colorado at Boulder.
1992-1999 Assistant Professor, Colorado Center for Astrodynamics Research, Department of Aerospace Engineering Sciences, University of Colorado at Boulder.
1991-Present Instructor, Navtech Seminars, Inc., Arlington, VA.
1991-1992 Lecturer, Department of Aeronautics and Astronautics, Stanford University.
1990-1992 Member of the Technical Staff and Program Manager, GPS Systems Organization, Stanford Telecommunications Inc., Santa Clara, CA.
1986-1990 Graduate Research Assistant, Gravity Probe B, Stanford University.
1985-1986 Systems Engineer, Space and Communications Group, Hughes Aircraft Co., El Segundo, CA.

Honors and Awards

American Institute of Aeronautics and Astronautics Summerfield Book Award (2011)
University of Colorado, College of Engineering and Applied Science, Max S. Peters Faculty Service Award (2009)
Institute of Navigation Johannes Kepler Award (2009)
Fellow, American Institute of Aeronautics and Astronautics (2008)
Institute of Navigation Outstanding Service Award (2005)
Fellow, Institute of Navigation (2004)
University of Colorado, Subaru Educator Spotlight (2004)
Senior Member, Institute of Electrical and Electronics Engineers (2003)
Institute of Navigation Tycho Brahe Award (2003)
AIAA Lawrence Sperry Award (1996)
AAS/AIAA Space Flight Mechanics Meeting Best Paper Award (1996)

Naval Research Laboratory Alan Berman Annual Research Publications Award (1995, 2000)
 AIAA Rocky Mountain Section, Young Engineer of the Year (1995)
 AIAA Guidance, Navigation and Control Conference Best Paper Award (1993)
 Stanford University Graduate Fellowship (1986)
 Hughes Aircraft Company Graduate Fellowship (1986)
 James Means Award for Leadership in Aerospace Design (1985)
 Member Sigma Xi and Tau Beta Pi

Professional Activities

Institute of Navigation (ION)

2007-2010	Program Co-Chair, ION/IEEE PLANS
2004-2005	President
2003-2004	Executive Vice President
2000-2002	Chair, Satellite Division
1998-2000	Vice-Chair, Satellite Division
1997	General Chair, ION GPS-97
1996	Program Chair, ION GPS-96
1995	General Chair, ION National Technical Meeting
1994-1996	Secretary, Satellite Division
1994-1995	Vice President, Western Region
1994	Technical Program Chair, ION National Technical Meeting
1993-present	Associate Editor, Navigation
1993-1996	Faculty Advisor, University of Colorado Student Chapter
1993-1994	Chair, Student Awards Committee
1992-1994	Council Space Representative
1993	Technical Chair, ION GPS-93
1993	Chair, Rocky Mountain Section
1991-1992	Western Region Council Member at Large
1988-1989	Chair, Annual Satellite Division Student session

Committee Membership

2009	Keck Institute for Space Studies External Advisory Committee
2005-2006	NASA ST9 Precision Formation Flying Technology Review Board
2002-2012	Member of the Massachusetts Institute of Technology, Department of Aeronautics and Astronautics Visiting Committee
1994-Present	Member of the Draper Corporation
1994-1995	Member, National Research Council Committee on the Future of the Global Positioning System

University of Colorado (CU) Service Activities

2006-2007	University of Colorado Emerging Leaders Program Fellow
2005-Present	Faculty Teaching Excellence Faculty Associate
2005-2007	College of Engineering First Level Review Committee
2005-2007	Aerospace Engineering Sciences Coop Program Faculty Advisor
2004-2006	CRCW Committee
2003-2005	LEAP Program Coach
2002-03, 04-05	Aerospace Engineering Sciences Department, Search Committee Chair
1999-2008	Faculty Teaching Excellence Program Advisory Board

1998-2002 CU, College of Engineering Summer Success Institute
 1994-2002 Lab Demonstrations for Women in Engineering Program High School Career Day

Journal Publications

Names of Dr. Axelrad's students are underlined.

1. Parkinson, B.W. and P. Axelrad, "Autonomous GPS Integrity Monitoring Using the Pseudorange Residual," *NAVIGATION*, Vol. 35, No. 2, p. 255-274, 1988.
2. Axelrad, P. and B.W. Parkinson, "Closed Loop Navigation and Guidance for Gravity Probe B Orbit Insertion," *NAVIGATION*, Vol. 36, No. 1, p. 45-61, 1989.
3. Green, G.B. and P. Axelrad, "Space Applications of GPS," *NAVIGATION*, Vol. 36, No. 3, p. 239-251, 1989.
4. Kee, C., B.W. Parkinson, and P. Axelrad, "Wide Area Differential GPS," *NAVIGATION*, Vol. 38, No. 2, p. 123-146, 1991.
5. Born, G.H., M.E. Parke, P. Axelrad, K.L. Gold, J. Johnson, K.W. Key, D.G. Kubitschek, E.J. Christensen, "Calibration of the TOPEX altimeter using a GPS buoy," *Journal of Geophysical Research*, Vol. 99, No. C12, p. 24,517-24,526, 1994.
6. Adams, L.J., P. Axelrad, et al., *The Global Positioning System - A Shared National Asset, A Report by the Committee on the Future of the Global Positioning System*, National Academy Press, 264 pages, 1995.
7. Axelrad, P., C.J. Comp, and P.F. MacDoran, "SNR Based Multipath Error Correction for GPS Differential Phase," *IEEE Transactions on Aerospace & Electronic Systems*, Vol. 32, No. 2, p. 650-660, April 1996.
8. Axelrad, P. and L.M. Ward, "Spacecraft Attitude Estimation Using the Global Positioning System: Methodology and Results for RADCAL," *Journal of Guidance, Control and Dynamics*, Vol. 19, No. 6, p. 1201-1209, November-December 1996.
9. Melvin, P.J., L.M. Ward, and P. Axelrad, "The Analysis of GPS Attitude Data From a Slowly Rotating, Symmetrical Gravity Gradient Satellite," *Journal of the Astronautical Sciences*, Vol. 44, p. 515-539, October-December 1996.
10. Axelrad, P. and C.P. Behre, "Attitude Estimation Algorithms for Spinning Satellites Using GPS Phase Data," *Journal of Guidance, Control and Dynamics*, Vol. 20, No. 1, p. 164-169, January-February 1997.
11. Ward, L.M. and P. Axelrad, "A Combined Filter for GPS-Based Attitude and Baseline Estimation," *NAVIGATION*, Vol. 44, No. 2, p. 195-213, 1997.
12. Comp, C.J. and P. Axelrad, "Adaptive SNR-Based Carrier Phase Multipath Mitigation Technique", *IEEE Transactions on Aerospace & Electronic Systems*, Vol. 34, No. 1, p. 264-276, January 1998.
13. Irish, K., K. Gold, G. Born, A. Reichert, and P. Axelrad, "Precision Orbit Determination for the Geosat Follow-On Satellites," *Journal of Spacecraft and Rockets*, Vol. 35, No. 3, p. 336-341, May-June 1998.
14. Garrison, J.L., P. Axelrad, and N.J. Kasdin, "Ill-Conditioned Covariance Matrices in the First-Order Two-Step Estimator," *Journal of Guidance, Control and Dynamics*, Vol. 21, No. 5, p. 754-760, September-October 1998.
15. Axelrad, P., and C.P. Behre, "Satellite Attitude Determination Based on GPS Signal-to-Noise Ratio," (Invited Paper) *Proceedings of the IEEE*, Vol. 87, No. 1, p. 133-144, January 1999.
16. Komjathy, A., V.U. Zavorotny, P. Axelrad, G.H. Born, and J.L. Garrison, "GPS Signal Scattering from Sea Surface: Wind Speed Retrieval Using Experimental Data and Theoretical Model," *Journal of Remote Sensing of Environment*, Vol. 73, p. 162-174, August 2000.
17. Moreau, M., P. Axelrad, J.L. Garrison, and A. Long, "GPS Receiver Architecture and Expected Performance for Autonomous Navigation in High Earth Orbits," *NAVIGATION*, Vol. 47, No. 3, p. 191-204, 2000.
18. Bauer, F.H., P. Axelrad, et al., "Enabling Spacecraft Formation Flying in Any Earth Orbit Through Spaceborne GPS and Enhanced Autonomy Technologies," *Space Technology*, Vol. 20, No. 4, p. 175-185, 2001.

19. Reichert, A.K. and P. Axelrad “Carrier-Phase Multipath Corrections for GPS-Based Satellite Attitude Determination,” *NAVIGATION*, Vol 48. No.2, p. 77-88, 2001.
20. Goldstein, D., G. Born and P. Axelrad “Real-time, Autonomous, Precise Orbit Determination Using GPS,” *NAVIGATION*, Vol. 48, No. 3, p. 155-168, 2001.
21. Thompson, B., M.C. Meek, K.L. Gold, P. Axelrad, G.H. Born, and D.G. Kubitschek, “Orbit Determination for the QuikSCAT Spacecraft,” *Journal of Spacecraft and Rockets*, Vol. 39, No. 6, p. 852-858, November-December 2002.
22. Madhani, P.H., P. Axelrad, K. Krumvieda, and J. Thomas, “Application of Successive Interference Cancellation to the GPS Pseudolite Near-Far Problem,” *IEEE Transactions on Aerospace and Electronic Systems*, Vol. 39, No.2, p. 481-489, April 2003.
23. Komjathy, A., M. Armatys, D. Masters, P. Axelrad, V.U. Zavorotny and S.J. Katzberg, “Retrieval of Ocean Surface Wind Speed and Wind Direction Using Reflected GPS Signals,” *Journal of Atmospheric and Oceanic Technology*, Vol.21, No.3, p. 515-526, March 2004.
24. Mickler, D., G.H. Born, and P. Axelrad “Using GPS Reflections for Satellite Remote Sensing,” *Acta Astronautica*, Vol. 55:1, p. 39-49, 2004.
25. Masters, D., P. Axelrad, and S. Katzberg, “Initial Results of Land-Reflected GPS Bistatic Radar Soil Moisture Measurements in SMEX02,” *Remote Sensing of Environment*, Vol. 92:4 p. 507-520, 2004.
26. Choi, K., A. Bilich, K.M. Larson, and, P. Axelrad, “Modified Sidereal Filtering: Implications for High-Rate GPS Positioning,” *Geophys. Res. Lett.*, Vol. 31, No. 22, 2004.
27. Weiss, J.P., S. Anderson, and P. Axelrad, “Development of Multipath Error Budgets for JPALS Ground Station Receivers,” *NAVIGATION*, Vol. 52, No. 3, p. 145-154, 2005.
28. Lane, C., and P. Axelrad, “Formation Design in Eccentric Orbits Using Linearized Equations of Relative Motion,” *Journal of Guidance, Control, and Dynamics*, Vol. 29, No. 1, p. 146-160, 2006.
29. Meek, M.C., G.H Born, and P. Axelrad, “Automated Operational Orbit Determination for the Ice Cloud and Land Elevation Satellite Mission,” *Journal of Spacecraft and Rockets*, Vol. 43, No. 5, p. 1048-1053, Sept-Oct 2006.
30. Belmonte-Rivas, M., J. Maslanik, J. Sonntag, P. Axelrad, “Sea Ice Roughness from Airborne Lidar Profiles,” *IEEE Transactions on Geoscience and Remote Sensing*, Volume 44, Issue 11, p. 3032 – 3037, 2006.
31. Lane, C. and P. Axelrad, “Analysis of Relative Navigation in High Earth Orbits,” *Journal of the Astronautical Sciences*, Vol. 55, No 1, Jan-Mar 2007, p. 23-52.
32. Larson, K., A. Bilich, and P. Axelrad, “Improving the precision of high-rate GPS,” *Journal of Geophysical Research*, 112, B05422, doi:10.1029/2006JB004367, 2007.
33. Lane, C. and P. Axelrad, “Relative Semimajor Axis Uncertainty in High Earth Orbits,” *Journal of Guidance, Control, and Dynamics*, Vol. 30, No. 6, p. 1827-1830, 2007.
34. Weiss, Jan P., P. Axelrad, S. Anderson, “A GNSS Code Multipath Model for Semi-Urban, Aircraft, and Ship Environments,” *NAVIGATION*, Vol. 54, No.4, p. 294-307, 2007.
35. Larson, K. M., E. E. Small, E. Gutmann, A. Bilich, P. Axelrad, and J. Braun, “Using GPS multipath to measure soil moisture fluctuations: initial results,” *GPS Solutions*, Vol 12 (3), p. 173-177, doi:10.1007/s10291-007-0076-6, July 2008.
36. Bilich, A., K. M. Larson and P. Axelrad, “Modeling GPS Phase Multipath with SNR: Case study from Salar de Uyuni, Bolivia,” *Journal of Geophysical Research*, 113, B04401, doi:10.1029/2007JB005194, 2008.
37. Jah, M.K., M.E. Lisano, G.H. Born, and P. Axelrad, “Mars Aerobraking Spacecraft State Estimation by Processing Inertial Measurement Unit Data,” *Journal of Guidance, Control, and Dynamics*, Vol. 31, No. 6, p. 1802-1813, 2008.
38. Belmonte Rivas, M., J. Maslanik, P. Axelrad, “Bistatic scattering of GPS signals off Arctic Sea Ice,” *IEEE Transactions on Geoscience and Remote Sensing*, Vol. 48, No. 3, p. 1548-1553, March 2010.
39. Vinande, E., P. Axelrad, D. Akos, "Mounting Angle Estimation For Personal Navigation Devices," *IEEE Transactions on Vehicular Technology*, Vol.59, No. 3, p. 1129-1138, March 2010.

40. Tombasco, J., P. Axelrad, M. Jah, "Analysis of Specialized Coordinate Representation for Dynamic Modeling and Orbit Estimation in the Geosynchronous Regime," *Journal of Guidance, Dynamics, and Control*, Vol. 33, No. 6, p. 1824-1836, 2010.
41. Axelrad, P., "Global Navigation Satellite Systems," in *Encyclopedia of Aerospace Engineering*, R. Blockley and W. Shyy (eds). John Wiley & Sons Ltd., Chichester, UK, p. 3167-3178, 2010.

Manuscripts in Review

42. Axelrad, P., B.K. Bradley, J. Donna, M. Mitchell, S. Mohiuddin, "Collective Detection and Direct Positioning Using Multiple GNSS Satellites," submitted to *NAVIGATION* October 2010.
43. Tombasco, J.M. and P. Axelrad, "A Study of the Achievable Geosynchronous Angles-Only Orbit Estimation Accuracy," submitted to *Journal of Astronautical Sciences*, December 2010.

Books and Book Chapters

1. Axelrad, P. and R.G. Brown, "GPS Navigation Algorithms," in *Global Positioning System: Theory and Applications*, Ed. by B.W. Parkinson, J.J. Spilker, Assoc. Ed. P. Axelrad and P. Enge, Progress in Astronautics and Aeronautics, Vol. 163, Chapt 9, American Institute of Aeronautics and Astronautics, 409-433, 1996.
2. *Global Positioning System: Theory and Applications*, Ed. by B.W. Parkinson, J.J. Spilker, Assoc. Ed. P. Axelrad and P. Enge, Progress in Astronautics and Aeronautics, Volumes 163 and 164, American Institute of Aeronautics and Astronautics, 1394 pages, 1996.

Conference Proceedings

NOTE: ION conference papers are selected for presentation and inclusion in the proceedings based on an abstract. AIAA/AAS Papers are selected for presentation and inclusion in the proceedings based on a draft of the paper. All items listed here include actual papers as well as presentation material.

1. Axelrad, P. and J.F. Kelley, "Near Earth Orbit Determination and Rendezvous Navigation Using GPS," *IEEE PLANS*, p. 184-191, Las Vegas, NV, November 1986.
2. Parkinson, B.W. and P. Axelrad, "Simplified GPS Integrity Checking with Multiple Satellites," *ION National Technical Meeting*, Dayton, OH, p. 78-83, January 1987.
3. Parkinson, B.W. and P. Axelrad, "A Basis for the Development of Operational Algorithms for Simplified GPS Integrity Checking," *ION Satellite Division Meeting*, Colorado Springs, CO, p. 269-276, September 1987.
4. Parkinson, B.W. and P. Axelrad, "A Practical Algorithm for Autonomous Integrity Verification Using the Pseudo Range Residual," *ION National Technical Meeting*, Santa Barbara, CA, p. 254-260, January 1988.
5. Parkinson, B.W. and P. Axelrad, "Closed Loop Orbit Trim Using GPS," *40th International Astronautical Congress*, Malaga, Spain, IAF-89-393, 14 pages, October 1989.
6. Kee, C., B.W. Parkinson, and P. Axelrad, "Wide Area Differential GPS," *ION- GPS 90*, Colorado Springs, CO, p. 587-598, September 1990.
7. Axelrad, P., R.H. Vassar, and B.W. Parkinson, "Gravity Probe B Orbit Modeling and Injection Requirements," *AAS/AIAA Spaceflight Mechanics Meeting*, Houston, TX, AAS 91-164, February 1991.
8. Hanson, P., P. Axelrad, T. Hayashi, and T. Ishizaki, "A Real-Time GPS Kinematic Survey System (GKSS)," *ION- GPS 92*, Albuquerque, NM, p. 1005-1013, September 1992.
9. Axelrad, P. and B.C. Chesley, "Performance Testing of a GPS Based Attitude Determination System.," *AIAA Guidance, Navigation, and Control Conference*, Monterey, CA, p. 809-819, August 1993. (Received award for best paper presented at the conference.)

10. Axelrad, P. and L.M. Ward, "On-Orbit GPS Based Attitude and Antenna Baseline Estimation," *ION National Technical Meeting*, San Diego, CA, p. 441-450, January 1994.
11. Chesley, B.C. and P. Axelrad, "An Integrated GPS Attitude Determination System for JAWSAT," *ION-GPS 94*, Salt Lake City, UT, p. 1251-1261, September 1994.
12. Axelrad, P., C.J. Comp, and P.F. MacDoran, "Use of Signal-to-Noise Ratio for Multipath Error Correction in GPS Differential Phase Measurements," *ION-GPS 94*, Salt Lake City, UT, p. 655-666, September 1994. (Received award for best paper out of eight in the session.)
13. Park, M., G. Born, P. Axelrad, K. Gold, K. Key, D. Kubitshek, T. Kelecy, J. LaMance, C. Rocken, and J. Johnson," *ION-GPS 94*, Salt Lake City, UT, p. 221-230, September 1994.
14. Lawrence, D.A., T.E. Holden, F. Padiou, P. Axelrad, and M. Malone, "Disturbance Learning Control for Small Satellites," *American Control Conference*, Baltimore, MD, p. 2882-2886, 1994.
15. Ward, L.M. and P. Axelrad, "Spacecraft Attitude Estimation Using GPS: Methodology and Results for RADCAL," *ION National Technical Meeting*, Anaheim, CA, p. 813-825, January 1995.
16. Chesley, B.C. and P. Axelrad, "Mitigating Measurement Errors in a Low Cost Satellite Attitude Determination System," *ION National Technical Meeting*, Anaheim, CA, p. 763-774, January 1995.
17. Gold, K., G.H. Born, K. Irish, A. Reichert, R. Markin, B. Binning, P. Axelrad, S. Mitchell, W. Frazier, W. Bertiger, and G. Hajj, "Precision Orbit Determination in the Geosat Orbit," *ION National Technical Meeting*, Anaheim, CA, p. 579-591, January 1995.
18. Melvin, P.J., L.M. Ward, and P. Axelrad, "The Analysis of GPS Attitude Data From a Slowly Rotating, Symmetrical Gravity Gradient Satellite," *Spaceflight Mechanics 1995, Advances in the Astronautical Sciences*, Vol. 89, Part 1, p. 539-558, 1995. (Received a 1995 Alan Berman Research Publications Award from the Naval Research Laboratory)
19. Garrison, J.L., T.G. Gardner, and P. Axelrad, "Relative Motion in Highly Elliptical Orbits," *Spaceflight Mechanics 1995, Advances in the Astronautical Sciences*, Vol. 89, Part 2, p. 1359-1376, 1995.
20. Axelrad, P. and C.P. Behre, "A Comparison of GPS-Based Attitude Estimation Techniques for Spinning Satellites," *ION GPS-95*, Palm Springs, CA, p. 1785-1796, September 1995.
21. Garrison, J.L., and P. Axelrad, "Application of the Extended Kalman Filter for Relative Navigation in an Elliptical Orbit," *Spaceflight Mechanics 1996, Advances in the Astronautical Sciences*, Vol. 93, Part 1, 693-712, 1996. (Received award for best paper presented at the conference.)
22. Irish, K.J., K. Gold, G. Born, R. Markin, A. Reichert, P. Binning, P. Axelrad, and C. Behre, "Precision Orbit Determination for GFO and GFO-2," *Spaceflight Mechanics 1996, Advances in the Astronautical Sciences*, Vol. 93, Part 2, 1331-1342, 1996. (Received award for best paper in session.)
23. Solomon, S.C., C.A. Barth, P. Axelrad, et al., "The Student Nitric Oxide Explorer," *Space Sciencecraft Control and Tracking in the New Millenium*, SPIE Proceedings Series Vol 2810, p. 121-132, August 1996.
24. Comp, C.J. and P. Axelrad, "An Adaptive SNR-Based Carrier Phase Multipath Mitigation Technique", *ION GPS-96*, Kansas City, MO, p. 683-697, September 1996.
25. Ward, L.M. and P. Axelrad, "A Combined Filter for GPS-Based Attitude and Baseline Estimation", *ION GPS-96*, Kansas City, MO, p. 1047-1061, September 1996. (Received award for best paper in session.)
26. Garrison, J.L., P. Axelrad, and N.J. Kasdin, "On the Possibility of Ill-Conditioned Covariance Matrices in the First-Order Two-Step Estimator," *Spaceflight Mechanics 1997, Advances in the Astronautical Sciences*, Vol. 95, Part 2, 1087-1102, 1997.
27. Reichert, A., P. Axelrad, S.C. Wu, W. Bertiger, and J. Srinivasan, "Initial Demonstration of a Point Solution Algorithm for Orbit Determination Using the microGPS Receiver," *ION National Technical Meeting*, Santa Monica, p. 377-387, January 1997.
28. Behre, C.P. and P. Axelrad, "Coarse Single-Axis Attitude Estimation Using GPS Signal-to-Noise Ratio," *KIS'97 Conference*, Banff, Canada, p. 417-427, June 2-6, 1997.

29. Axelrad, P., and D.E. Highsmith, "Post-Processed Attitude and Baseline Estimation for the GPS Attitude and Navigation Experiment (GANE)," *ION Annual Meeting*, Albuquerque, NM, p. 353-363, June 1997.
30. Davis, G.W., K.L. Gold, P. Axelrad, G.H. Born, T.V. Martin, "A Low Cost, High Accuracy Automated GPS-Based Orbit Determination System for Low Earth Satellites," *ION GPS-97*, Kansas City, MO, p. 723-733, September 1997.
31. Nelson, L.M., P. Axelrad, and D.M. Etter, "Adaptive Detection of Code Delay and Multipath in a Simplified GPS Signal Model," *ION GPS-97*, Kansas City, MO, p. 569-581, September 1997.
32. Garrison, J.L. and P. Axelrad, "Relative Navigation in Highly Elliptical Orbits Using an Iterative Nonlinear Filter," *ION GPS-97*, Kansas City, MO, p. 745-754, September 1997.
33. Highsmith, D. and P. Axelrad, "A Batch Filter for Baseline Estimation Using On-Orbit GPS and Gyro Data," *ION Annual Meeting*, Denver, CO, p. 133-143, June 1998.
34. Komjathy, A., V. Zavorotny, P. Axelrad, G. Born, and J. Garrison, "GPS Signal Scattering from Sea Surface: Comparison Between Experimental Data and Theoretical Model," *Fifth International Conference on Remote Sensing for Marine and Coastal Environments*, San Diego, CA, p. 530-539, October 1998.
35. Moreau, M., P. Axelrad, J.L. Garrison, D. Kelbel, and A. Long, "GPS Receiver Architecture and Expected Performance for Autonomous GPS Navigation in Highly Eccentric Orbits," *ION Annual Meeting*, Boston, MA, p. 653-665, June 1999.
36. Kubitschek, D.G., K. Gold, M. Ondrey, P. Axelrad, and G.H. Born, "ICESat Attitude Algorithm for Maintained Reference Groundtrack Pointing," *Astrodynamics 1999, Advances in the Astronautical Sciences*, Vol. 103, Part 2, p. 1115-1130, August 1999.
37. Mickler, D., P. Axelrad, and G.H. Born, "Reducing Selective Availability Effects on Post-Processed Orbits for Satellites with Limited GPS Telemetry," *Spaceflight Mechanics 1999, Advances in the Astronautical Sciences*, Vol. 102, Part 2, 1477-1489, 1999.
38. Axelrad, P., K. Gold, P. Madhani, and A. Reichert, "Analysis of Orbit Errors Induced by Multipath for the ICESat Observatory," *ION GPS-99*, Nashville, TN, p. 875-883, September 1999.
39. Highsmith, D. and P. Axelrad, "Relative State Estimation Using GPS Flight Data from Co-Orbiting Spacecraft," *ION GPS-99*, Nashville, TN, p. 401-409, September 1999.
40. Reichert, A. and P. Axelrad, "GPS Carrier Phase Multipath Reduction Using SNR Measurements to Characterize an Effective Reflector," *ION GPS-99*, Nashville, TN, p. 1951-1960, September 1999.
41. Armatys, M., D. Masters, A. Komjathy, P. Axelrad, and J.L. Garrison, "Exploiting GPS as a New Oceanographic Remote Sensing Tool," *ION National Technical Meeting*, Anaheim, CA, p. 339-347, January 2000.
42. Komjathy, A., J.A. Maslanik, V.U. Zavorotny, P. Axelrad, and S.J. Katzberg, "Towards GPS Surface Reflection Remote Sensing of Sea Ice Conditions," *Sixth International Conference on Remote Sensing for Marine and Coastal Environments*, Charleston, SC, Vol. II, p. 447-456, 1-3 May 2000.
43. Armatys, M., A. Komjathy, P. Axelrad, and S.J. Katzberg, "A Comparison of GPS and Scatterometer Sensing of Ocean Wind Speed and Direction," *IEEE Geoscience and Remote Sensing Symposium IGARSS 2000*, Vol. 7, p. 2861 -2863, 2000.
44. Emery, W.J., P. Axelrad, D. Masters, S. Solomon, and M. McGrath, "Ocean Wind and Land Surface Student Satellite (OWLS)," *IEEE Geoscience and Remote Sensing Symposium IGARSS 2000*, Vol. 7, p. 3084 -3086, 2000.
45. Komjathy, A., J. Maslanik, V.U. Zavorotny, P. Axelrad, and S.J. Katzberg, "Sea ice remote sensing using surface reflected GPS signals," *IEEE Geoscience and Remote Sensing Symposium IGARSS 2000*, Vol. 7, p. 2855 -2857, 2000.
46. Highsmith, D.E., P.W. Binning, and P. Axelrad, "Design and Test of an Algorithm for Satellite-to-Satellite Time Transfer," *ION GPS-2000*, Salt Lake City, UT, p. 1582-1594, September 2000 (Received 2000 Alan Berman Research Publications Award from the Naval Research Laboratory).

47. Komjathy, A., M. Armatys, D. Masters, P. Axelrad, V.U. Zavorotny, and S.J. Katzberg, "Developments in Using GPS for Oceanographic Remote Sensing: Retrieval of Ocean Surface Wind Speed and Wind Direction," *ION National Technical Meeting*, Long Beach, CA, pp. 753-761, January 2001.
48. Goldstein, D.B., G.H. Born, and P. Axelrad, "Real-time Autonomous, Precise Orbit Determination Using GPS," *ION 57th Annual Meeting*, Albuquerque, NM, p. 149-158, June 2001.
49. Garrison, J.L., M. Moreau, and P. Axelrad, "Tracking Loop Optimization for On-Board Orbit Navigation in HEO/GEO Missions," *ION 57th Annual Meeting*, Albuquerque, NM, p. 168-175, June 2001.
50. Thompson, B., P. Axelrad, and G.H. Born, "Orbit Determination for the QuikSCAT Spacecraft," *2001 Flight Mechanics Symposium*, NASA GSFC, Greenbelt, MD, June 2001.
51. Armatys, M., P. Axelrad, D. Masters, "GPS-Based Remote Sensing of Ocean-Surface Wind Speed from Space," *IEEE Geoscience and Remote Sensing Systems (IGARSS) 2001*, Sydney, Australia, p. 2522-2524, 2001.
52. Emery, W.J., P. Axelrad, R.S. Nerem, D. Masters, M. Armatys, and A. Komjathy, "Student Reflected GPS Experiment (SuRGE)," *IEEE Geoscience and Remote Sensing Systems (IGARSS) 2001*, Sydney, Australia, p. 1518-1520, 2001.
53. Nerem, R. S., J. C. Ries, P. Bender, B. Thompson, P. Axelrad, J. Labrecque, and M. Gabor, "Applications of Drag-Free Technology to Precision Satellite Navigation," *Astrodynamics 2001, AAS/AIAA Astrodynamics Specialist Conference*, p. 1757-1768, 2001.
54. Masters, D., P. Axelrad, V. Zavorotny, S.J. Katzberg, and F. Lalezari, "A Passive GPS Bistatic Radar Altimeter for Aircraft Navigation," *ION GPS-2001*, Salt Lake City, OR, p. 2435-2445, September 2001 (Received award for best paper in session.).
55. Madhani, P.H., P. Axelrad, K. Krumvieda, J. Thomas, "Mitigation of the Near-Far Problem by Successive Interference Cancellation," *ION GPS-2001*, Salt Lake City, UT, p. 148-154, September 2001 (Received award for best paper in session.).
56. Krumvieda, K., C. Cloman, E. Olson, J. Thomas, W. Kober, P.H. Madhani, P. Axelrad, "A Complete IF Software GPS Receiver: A Tutorial About the Details," *ION GPS-2001*, Salt Lake City, UT, p. 789-829, September 2001.
57. Moreau, M., P. Axelrad, J.L. Garrison, M. Wennersten, A. Long, "Test Results of the PiVoT Receiver in High Earth Orbits Using a GSS GPS Simulator," *ION GPS-2001*, Salt Lake City, UT, p. 2316-2326, September 2001.
58. Moreau, M., E.P. Davis, J.R. Carpenter, D. Kelbel, G.W. Davis, and P. Axelrad, "Results from the GPS Flight Experiment on the High Earth Orbit AMSAT OSCAR-40 Spacecraft," *ION GPS-2002*, Portland, OR, p. 122-133, September 2002.
59. Meek, M., K. Gold, Y. Hwang, P. Axelrad, and G. Born, "Orbit Determination for the Quickbird Spacecraft," *Proceedings of the 2002 Core Technologies for Space Systems Conference*, Colorado Springs, CO, November 19-21, 2002.
60. Meek, M., G.H. Born, K.S. Morris, and P. Axelrad, "Automated Operational Orbit Determination for the ICESat Mission," *John L. Junkins Astrodynamics Symposium AAS/AIAA Space Flight Mechanics Meeting*, College Station, TX, May 23-24, 2003.
61. Masters, D., Katzberg, S., Axelrad, P., (2003), "Airborne GPS Bistatic Radar Soil Moisture Measurements During SMEX02," *Proceedings of IEEE International Geoscience and Remote Sensing Symposium (IGARSS 2003)*.
62. Sturtevant, P., D. Masters, P. Axelrad, and S.J. Katzberg, "GPS-based Bistatic Radar for Terrain Awareness – Methods and Preliminary Results," *ION GPS/GNSS-2003*, Portland, OR, p. 2358-2370, September 2003 (Received award for best paper in session.).
63. Weiss, J.P., S. Anderson, P. Axelrad, R.L. Brinkley, and R.P. Pennline, "Multipath Modeling and Test Results for JPALS Ground Station Receivers," *ION GPS/GNSS-2003*, Portland, OR, p. 1801-1811, September 2003.
64. Zarske, M.S., P. Axelrad, J. Yowell, and J. Sullivan, "Navigation Modules for Middle School Students," *ION GPS/GNSS-2003*, Portland, OR, p. 418-424, September 2003.

65. Bilich, A., K.M. Larson, and P. Axelrad, "Observations of Signal-to-Noise Ratios (SNR) at Geodetic GPS Site CASA: Implications for Phase Multipath," *Proceedings of The State of GPS Vertical Positioning Precision: Separation of Earth Processes by Space Geodesy*, Luxembourg, April 2-4, 2003.
66. Axelrad, P., D. Akos, K. Larson, G. Born, S. Nerem, S. Palo, "GPS Research and Education at the University of Colorado, Boulder," *ION 60th Annual Meeting*, Dayton, OH, p. 223-229, June 7-9, 2004.
67. Weiss, J.P., S. Anderson, P. Axelrad, R. L. Brinkley and R. P. Pennline, "Analysis of P(Y) Code Multipath for JPALS LDGPS Ground Station and Airborne Receivers," *ION GNSS-2004*, Long Beach, CA, p. 2728-2741, September 21-24, 2004.
68. Anderson, S., J.P. Weiss, P. Axelrad and R.P. Pennline, "A GPS Multipath Simulator with Beam-Steering Antenna Modeling for JPALS LDGPS," *ION GNSS-2004*, Long Beach, CA, p. 2271-2282, September 21-24, 2004.
69. Lane, C., P. Axelrad, "Analysis of Formation Flying in Eccentric Orbits Using Linearized Equations of Relative Motion," *Proceedings of the 2nd International Symposium on Formation Flying Missions & Technologies*, Washington, DC, September 14-16, 2004.
70. Belmonte-Rivas, M., P. Axelrad, J. Maslanik, "Remote Sensing of the Cryosphere Using GPS Reflections," *Proceedings of the 2nd ESA Workshop on Satellite Navigation User Equipment Technologies*, Noordwijk, The Netherlands, 9 pages, December 8-10, 2004.
71. Vinande, E., D. Akos, D. Masters, P. Axelrad, S. Esterhuizen, "GPS Bistatic Radar Measurements of Aircraft Altitude and Ground Objects with a Software Receiver," *ION 61st Annual Meeting*, Cambridge, MA, p. 528-534, June 27-29, 2005.
72. Weiss, J., S. Anderson, C. Fenwick, L. Song, P. Axelrad, R.L. Brinkley, "Development and Validation of an Aircraft Multipath Model for Land-Based JPALS," *ION 61st Annual Meeting*, Cambridge, MA, p. 818-829, June 27-29, 2005.
73. Anderson, S., L.S. Stowe, C. Fenwick, J.P. Weiss, P. Axelrad, J. Stevens, R. L. Brinkley S. M. Calhoun, "Analysis of P(Y) Code and Carrier Multipath for JPALS Ship and Airborne Receivers," *ION GNSS-2005*, Long Beach, CA, p. 2195-2206, September 13-16, 2005
74. Axelrad, P., K. Larson, and B. Jones, "Use of the Correct Satellite Repeat Period to Characterize and Reduce Site Specific Multipath Errors," *ION GNSS-2005*, Long Beach, CA, p. 2638- 2648, September 13-16, 2005.
75. Weiss, J., S. Anderson, C. Fenwick, L. Stowe, P. Axelrad, S.M. Calhoun, R.P. Pennline, "Aircraft Carrier Multipath Modeling for Sea-Based JPALS," *ION GNSS-2005*, Long Beach, CA, p. 2697-2706, September 13-16, 2005 (Received award for best paper in session).
76. Lane, C. and P. Axelrad, "Analysis of Relative Navigation in Highly Eccentric Orbits," *AAS Guidance, Navigation, and Control Conference*, Breckenridge, CO, February 2006, AAS 06-147.
77. Lindgren, T., E. Vinande, D. Akos, D. Masters, P. Axelrad, "Measurement of Backscattered GPS Signals," *2006 IEEE/ION Position, Location, and Navigation Symposium*, San Diego, CA p. 664-669, Apr 25-27 2006.
78. Weiss, Jan P., S. Anderson, P. Axelrad, "Improved Multipath Model Validation in Semi-Urban, Aircraft, and Shipboard Environments," *International Global Navigation Satellite Systems Society Symposium 2006*, Surfers Paradise, Queensland, Australia, Paper No. 98, July 17-21, 2006
79. Junered, M., S. Esterhuizen, D. Akos, P. Axelrad, "A Modular GPS Remote Sensing Software Receiver for Small Platforms," *ION GNSS-2006*, Fort Worth, TX, p. 634-643, September 26-29, 2006.
80. Weiss, J.P., P. Axelrad, S. Anderson, "Assessment of Digital Terrain Models for Multipath Prediction at Geodetic GNSS Installations," *ION GNSS-2006*, Fort Worth, TX, p. 2815-2823, September 26-29, 2006.
81. Lane, C. and P. Axelrad, "Effects of Orbital Perturbations on the Performance of a Relative Navigation Filter for High Earth Orbits," *AAS/AIAA Space Flight Mechanics Meeting, Sedona, AZ, January 28-February 1, 2007*, AAS 07-155.
82. Weiss, Jan P., P. Axelrad, A. G. Dempster, C. Rizos, S. Lim, "Estimation of Simplified Reflection Coefficients for Improved Modeling of Urban Multipath," *Proc. ION 63rd Annual Meeting*, p. 635-643, Cambridge, MA, April 23-25, 2007.

83. Bilich, A., P. Axelrad, and K.M. Larson, "Scientific Utility of the Signal-to-Noise Ratio (SNR) Reported by Geodetic GPS Receivers," *ION GNSS-2007*, Fort Worth, TX, p. 1999-2010, September 25-28, 2007.
84. Weiss, J.P., and P. Axelrad, "Multipath Signal Simulation in a Dynamic Aircraft Landing Environment," *ION GNSS-2007*, Fort Worth, TX, p. 2687-2695, September 25-28, 2007. (Received award for best presentation in session.)
85. Tombasco, J., and P. Axelrad, "Linearized Relative State Estimation and Data Association for Orbit Determination of Clustered Geosynchronous Satellites," AIAA/AAS Astrodynamics Specialist Conference and Exhibit, Honolulu, HI, 22 pages, AIAA 2008-6605, August 18-21, 2008.
86. Axelrad, P., J. Donna, and M. Mitchell, "Enhancing GNSS Acquisition by Combining Signals from Multiple Channels and Satellites," *ION GNSS-2009*, Savannah, GA, p. 2617 - 2628, September 22-25, 2009.
87. Tombasco, J., P. Axelrad, M. Jah, "Analysis of Specialized Coordinate Representation for Dynamic Modeling and Orbit Estimation in the Geosynchronous Regime," 20th AAS/AIAA Space Flight Mechanics Meeting, February 14-17, 2010, San Diego, CA.
88. Bradley, B.K., Axelrad, P., J. Donna, S. Mohiuddin, "Performance Analysis of Collective Detection of Weak GPS Signals," *ION GNSS-2010*, Portland, OR, p. 3041-3053, September 21-24, 2010. (Received award for best presentation in session.)
89. Axelrad, P., B. K. Bradley, J. Tombasco, S. Mohiuddin, J. Donna, "GEO Satellite Positioning Using GPS Collective Detection," *ION GNSS-2010*, Portland, OR, p. 2706-2716, September 21-24, 2010. (Received award for best presentation in session.)

Other Publications

1. Axelrad, P., Near-Earth Orbit Determination and Rendezvous Navigation Using GPS, Master's Thesis, MIT, 1986.
- Parkinson, B.W. and P. Axelrad, "Techniques for Autonomous GPS Integrity Monitoring," AGARDograph No. 314, *Analysis, Design and Synthesis Methods for Guidance and Control Systems*, p. III-1-18, 1990.
- Axelrad, P., *A Closed-Loop GPS-Based Orbit Trim System for Gravity Probe B*, Ph. D. Dissertation, Stanford University, 1990.
- Axelrad, P., Invited essay for "Directions'96" Issue of *GPS World Magazine*, p. 50, December, 1995.
- Online : "Ten Lessons on Navigation" Authored by Jeffery White, Matt Lippis, Mindy Schaefer Zarske, Penina Axelrad, Janet Yowell. <http://www.ion.org/satdiv/education.cfm>
- Axelrad, P. and K.M. Larson, "GNSS Solutions: Is it true that the GPS satellite geometry repeats every day shifted by 4 minutes?" *InsideGNSS Magazine*, p. 16-17, July/August 2006.
- Axelrad, P., J. Donna, M. Mitchell, S. Mohiuddin, "Collective Detection - Enhancing GNSS Receiver Sensitivity by Combining Signals from Multiple Satellites," *GPS World Magazine*, p. 58-64, January 2010.

Select Invited Talks, Seminars and Colloquia

1. Invited speaker at the Institute for Mathematics and Its Applications, University of Minnesota, IMA "HOT TOPICS" workshop on Mathematical Challenges in Global Positioning System, "Retrieval of Ocean and Land Surface Characteristics Using Measurements of Reflected GPS Signals," August 18, 2000.
2. Invited lecture at Stanford University, "Remote Sensing of Ocean Surfaces Using Bistatic GPS," February 14, 2001.
3. University of Colorado, Faculty Teaching Excellence Program, "Establishing a Teaching Portfolio," March 2001.
4. University of Colorado, College of Engineering and Applied Science Orientation, Faculty Keynote Address, August 23, 2006.
5. Invited speaker for ZONTA Foothills Club, Amelia Earhart Dinner, "On encouraging young women to study science, math, and engineering," Broomfield, CO, January 28, 2007.

6. Invited tutorial seminar "Introduction to Global Navigation Satellite Systems," at 32st Annual Time and Frequency Metrology Seminar, NIST, Boulder, CO, June 14, 2007.
7. "GNSS Applications for Science and the Environment," 2nd International Summer School on GNSS, Berchtesgaden, Germany, July 30, 2008.
8. Invited speaker for Stanford University Department of Aeronautics and Astronautics 50th Anniversary Symposium, "Challenges and Opportunities in Aerospace Education," May 10, 2008.
9. Burkert, J. P. Axelrad, L. Cornman, K Goodrich, Scott Palo, Andrew Weekley, "Turbulence Estimation Techniques for COSMIC Occultation Data," Fourth FORMOSAT-3/COSMIC Data Users Workshop, Boulder, CO, 28 October, 2009.

Courses Taught

First Year Engineering Projects GEEN1400(University of Colorado)

General Engineering freshman level course providing hands-on experiences in analysis, design, and technical writing.

Introduction to Dynamics and Systems ASEN2003 (University of Colorado)

Sophomore core course on 2-D dynamics, vibrations, and systems. Includes experimental and design laboratories, group problem solving, traditional lecture, and interactive learning classes (5 credits).

Orbital Mechanics and Attitude Dynamics ASEN3200 (University of Colorado)

Junior core course on two body orbits, attitude dynamics and control. Includes experimental and design laboratories, group problem solving, traditional lecture, and interactive learning classes (4 credits).

Aerospace Electronics and Communications ASEN3300 (University of Colorado)

Junior core course introducing basics of analog and digital electronics, computer interfacing, and communications, focusing on hands-on learning and use of laboratory instruments. Includes experimental laboratories, traditional lecture, and interactive learning classes (4 credits).

Aerospace Senior Projects ASEN4018/4028 (University of Colorado)

Senior capstone design course member of Project Advisory Board

Introduction to Global Navigation Satellite Systems ASEN 5090 (University of Colorado)

Graduate level course introducing key technologies of GPS to Aerospace, Electrical, Civil Engineering and Physics students.

Radio and Inertial Navigation (University of Colorado, Stanford University)

Graduate level course on technologies and algorithms for navigation and positioning.

Ph.D. Graduates, University of Colorado, Boulder

1. Bruce C. Chesley, 1995 – Currently with Boeing Space Systems, Colorado Springs, CO
Dissertation – *An Integrated GPS Attitude Determination System for Small Satellites*
2. Lisa M. Ward, 1996 – Currently with Ball Aerospace, Bolder, CO
Dissertation – *Spacecraft Attitude Estimation Using GPS: Methodology and Results*
3. Christopher J. Comp, 1996 – Currently with Digital Globe, Longmont, CO
Dissertation – *GPS Carrier Phase Multipath Characterization and a Mitigation Technique Using the Signal-to-Noise Ratio*
4. James L. Garrison, 1997 – Currently Associate Professor of Aeronautics and Astronautics at Purdue University
Dissertation – *Recursive Nonlinear Estimation for Relative Navigation in Elliptical Orbits*
5. Charles P. Behre, 1997 – Currently with ITT, Los Angeles, CA
Dissertation – *GPS Based Attitude Algorithms for Low Cost Satellite Missions*
6. Angela (Reichert) Dorsey, 1999 – Currently with the Jet Propulsion Laboratory, Pasadena, CA
Dissertation – *Correction Algorithms for GPS Carrier Phase Multipath Utilizing the Signal-to-Noise Ratio and Spatial Correlation*
7. Franklin Ascarunz, 1999
Dissertation – *Timing Errors in Two-Way Satellite Time and Frequency Transfer Using Spread Spectrum Modulation*

8. Dolan Highsmith, 2000 – Currently with the Aerospace Corporation, Chantilly, VA
Dissertation – *Precise Satellite-to-Satellite GPS Time Transfer in Near Real-Time*
9. Michael Armatys, 2001 – Currently with Rockwell Collins, Cedar Rapids, IA
Dissertation – *Estimation of Sea Surface Winds Using Reflected GPS Signals*
10. Michael Moreau, 2001 – Currently with NASA Goddard Space Flight Center, Greenbelt, MD
Dissertation – *GPS Receiver Architecture for Autonomous Navigation in High Earth Orbits*
11. Premal Madhani, 2002 – Currently Navigation Algorithm Engineer with GlobalLocate, San Jose, CA
Dissertation – *GPS Receiver Algorithms for Suppression of Narrowband and Structured Wideband Interference*
12. Dallas Masters, 2004 – Currently independent consultant, France
Dissertation – *Surface Remote Sensing Applications of GNSS Bistatic Radar : Soil Moisture and Aircraft Altimetry*
13. Maria Belmonte Rivas, 2007 – Currently with National Center for Atmospheric Research (NCAR), Boulder, CO
Dissertation – *Bistatic Scattering of Global Positioning System Signals from Arctic Sea Ice*
14. Jan-Peter Weiss, 2007 – Currently with the Jet Propulsion Laboratory, Pasadena, CA
Dissertation – *Modeling and Analysis of Multipath in Global Navigation Satellite System Ranging Signals*
15. Christopher Lane, 2007 – Currently Director of Data Services with PublishThis, Los Angeles, CA
Dissertation – *Formation Design and Relative Navigation in High Earth Orbits*

M.S. Graduates, University of Colorado, Boulder

1. Jiyun Lee, 1999 - Currently Assistant Professor, Korea Advanced Institute of Science and Technology
2. Eden (Denton) Speed, 2001 – Currently with Lockheed Martin, Boulder, CO
3. Lisa (Reeh) Turner, 2002 – Currently with Lockheed Martin, Denver, CO
4. Cove (Paige) Sturtevant, 2004
5. Lin Song Stowe, 2006 – Currently with MIT Lincoln Laboratory, MA
6. Steven Brown, 2008 – Currently with Infinity Systems Engineering, Colorado Springs, CO
7. Julian Greene, 2009 – Currently with Lockheed Martin, Colorado Springs, CO
8. James Burkert, 2010 – Currently with Lockheed Martin, Denver, CO

Summer and Visiting Students, University of Colorado, Boulder

1. Estel Cardellach Gali – Visiting PhD student from Institut d'Estudis Espacials de Catalunya (IEEC-CSIC), 2003
2. Lennox Thompson – RESESS Program (UNAVCO), Undergraduate at Coppin State University, Baltimore, MD, 2006
3. Michael Williams – SMART Program, Undergraduate at UC Irvine, 2004
4. Johan Bejeryd – Visiting MS student from the Institute of Technology of Linkoping University, Sweden, 2008
5. Joseph Meilen – Visiting High School intern, 4 weeks, summer 2009
6. Antonella Albujah – SMART Program, Undergraduate at University of Iowa, 2010

Current Students

1. Jill Tombasco – Ph.D. Student, Comprehensive Exam 3/10/10
2. Ben Bradley – Ph.D. Student
3. Elliot Barlow – Ph.D. Student
4. John Pratt - Ph.D. Student (Co-advise with K.M. Larson)
5. Bruno Lesage - M.S. Student (Co-advise with K.M. Larson)
6. Jonah Kisesi - Ph.D. Student

Student Fellowships & Awards

Michael Armatys, NASA GSRP, 1998-2000

Elliot Barlow, Department of Education, Graduate Assistantship in Areas of National Need (GAANN) Fellowship, 2010-2011

Maria Belmonte Rivas, Zonta International Foundation Amelia Earhart Fellowship, 2004/2005, NASA Earth Systems Graduate Researcher, 2004 - 2007

Ben Bradley, National Defense Science and Engineering Graduate Fellowship, 2010-2012

James Burkert, NASA GSRP, 2008-2010

K.S. Crumpton, NASA GSRP, 1997

Christopher Lane, AIAA Graduate Student Researcher Award, 2006

Dallas Masters, John A. Vise Student Excellence Award 2003, NASA GSRP, 2000-2004

Michael Moreau, NASA GSRP, 1997-2000

Jill Tombasco, Zonta International Foundation Amelia Earhart Fellowship, 2010, National Defense Science and Engineering Graduate Fellowship, 2007-2010

Jan Weiss, John A. Vise Student Excellence Award 2007, NSF East Asia and Pacific Summer Institute Fellowship, 2006

Recent Committee Memberships

1. Nicholas Pedatella - Ph.D. Student (Prof. Larson), Comprehensive Exam 3/16/09
2. Marcus Holzinger - Ph.D. Student (Prof. Scheeres), Comprehensive Exam 3/8/10
3. Carl Seubert - Ph.D. Student (Prof. Schaub), Comprehensive Exam 4/8/10
4. Ravi Inampudi – Ph.D. (AES), 2010 (Prof. Schaub)
5. James McDonald - Ph.D. (ECE), 2010 (Prof. Filipovic)
6. Eric Vinande - Ph.D. (AES), 2010 (Prof. Akos)