

Mitchell L. R. Walker II
Georgia Institute of Technology
School of Aerospace Engineering
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Professional Interests:

Advanced spacecraft and aircraft propulsion, plasma physics and rarefied gas dynamics, Hall thruster clustering and facility effects, electric propulsion plume diagnostics

Education:

- Ph.D. Aerospace Engineering, December 2004, University of Michigan
- MSE Aerospace Engineering, December 2000, University of Michigan
- BSE Aerospace Engineering, December 1999, University of Michigan

Relevant Coursework (Graduate Level): Electric Propulsion, Gas Kinetic Theory, Plasma Physics, Rockets, Compressible Flows, Aerodynamics, Viscous Flows, Combustion, Turbulence, Numerical Methods

Ph.D. Thesis:

- Effects of Facility Backpressure on the Performance and Plume of a Hall Thruster
Advisor: Alec D. Gallimore

Work Experience:

Georgia Institute of Technology
Assistant Professor of Aerospace Engineering
Atlanta, GA
January 2005 - Present

- Director of the High-Power Electric Propulsion Laboratory
- Electric propulsion engine development, engine-spacecraft interaction studies, and the development of diagnostic tools

University of Michigan Plasmadynamics and Propulsion Laboratory
Graduate Student Researcher
Ann Arbor, MI
August 2000 – Dec. 2004

- Involved in dissertation research: Facility effects, Hall thruster clustering
- Assembled two 5-kW P5 Hall thrusters and cathodes
- Constructed a null-type inverted-pendulum thrust stand
- Set up and performed characterization tests on the Pratt & Whitney T-220HT 10-kW Hall thruster
- Set up and performed characterization tests of the Aerojet BPT-4000 4.5 kW Hall thruster

University of Michigan Academic Mentoring Program
Academic Mentor
Ann Arbor, MI
August 2002 – Dec. 2004

- Advised undergraduates in their terminal semester on how to reach their academic goals

University of Michigan Minority Engineering Program Office
Physics Instructor
Ann Arbor, MI
June 2003 – August 2003

- Presented lectures on introductory physics
- Evaluated student performance

Lockheed Martin Missiles & Space
Engineering Intern
Sunnyvale, CA
May 2000 – August 2000

- Performed tests on satellites in a clean room (1k) and ESD sensitive environment
- Analyzed arcjet performance data for the A2100 program
- Investigated arcjet bubble events for on-orbit satellites

Lockheed Martin Tactical Aircraft Systems
Engineering Intern (SECRET Clearance)
Fort Worth, TX
May 1999 – August 1999

- Tested turbojet sub-scale nozzles and presented data to engine manufacturers
- Presented an analysis of boundary layer profiles near secondary flow inlet on the F-16
- Conducted literature searches on supersonic secondary flow inlet performance
- Compiled CFD results into usable formats
- Created road maps of engine performance histories for marketing

Lockheed Martin Missiles & Space
Engineering Intern
Sunnyvale, CA
May 1998 – August 1998

- Performed tests on satellites in a clean room (1k) and ESD sensitive environment
- Analyzed flow of preliminary propulsion subsystem
- Created 3D models of preliminary propulsion subsystem components
- Analyzed on-orbit propulsion system telemetry
- Completed component qualification certificates for commercial satellite hardware

Lockheed Martin Missiles & Space
Engineering Intern
Sunnyvale, CA
May 1997 – August 1997

- Compiled electronic versions of propulsion subsystem drawings
- Incorporated design changes into current drawings
- Answered customer questions on propulsion subsystem performance
- Corresponded with vendors in respect to hardware

Security Clearance Level: SECRET (Interim)

Journal Publications:

1. Kieckhafer, A. W., Walker, M. L. R., “**Development of a Helicon RF Power Delivery System for Use with Electric Propulsion Performance Diagnostics,**” July 2009 – In Progress
2. Williams, L. T., Walker, M. L. R., Kumsomboone, V. S., Ready, W. J., “**Experimental Characterization of Carbon Nanotube Field Emission Cathode Lifespan,**” Journal of Physics D, August 2009 - In Review
3. Williams, L. T., Walker, M. L. R., Kumsomboone, V. S., Ready, W. J., “**Experimental Characterization of an Arrayed Carbon Nanotube Field Emission Cathode,**” Physical Review B, August 2009 - In Review
4. Palmer, D. D., Walker, M. L. R., “**Performance Analysis of a Medium-Power Helicon Thruster,**” Journal of Propulsion and Power, October, 2008. – In Review.
5. Palmer, D. D., Walker, M. L. R., “**Operation of an Annular Helicon Plasma Source,**” Journal of Propulsion and Power, Volume 25, Number 5, September-October, pp. 1013-1019.
6. Xu, K., Walker, M. L. R., “**High-Power, Null-Type, Inverted Pendulum Thrust Stand,**” Review of Scientific Instruments, Volume 80, Number 5, May 2009.
7. Walker, M. L. R., Gallimore, A. D., “**Hall Thruster Cluster Operation with a Shared Cathode,**” Journal of Propulsion and Power, Volume 23, Number 3, May 2007.
8. Yano, M., Walker, M. L. R., “**Generalized Theory of Annularly-Bounded Helicon Waves,**” Physics of Plasmas, Volume 14, Number 3, March 2007.

9. Walker, M. L. R., Gallimore, A. D., "**Performance Characteristics of a Cluster of 5-kW Laboratory Hall Thrusters**," Journal of Propulsion and Power, Volume 23, Number 1, January 2007.
10. Yano, M., Walker, M. L. R., "**Plasma Ionization by Annularly-Bounded Helicon Waves**," Physics of Plasmas, Volume 13, Number 6, June 2006.
11. Rovey, J. L., Walker, M. L. R., Peterson, P. Y., Gallimore, A. D., "**A Magnetically-Filtered Faraday Probe for Measuring the Ion Current Density Profile of a Hall Thruster**," Review of Scientific Instruments, Volume 77, Number 1, January 2006.
12. Walker, M. L. R., Hofer, R. R., Gallimore, A. D., "**Ion Collection in Hall Thruster Plumes**," Journal of Propulsion and Power, Volume 22, Number 1, Jan.-Feb., 2006.
13. Walker, M. L. R., Victor, A. L., Hofer, R. R., Gallimore, A. D., "**Effect of Backpressure on Ion Current Density Measurements in Hall Thruster**," Journal of Propulsion and Power, Volume 21, Number 3, May-June, 2005.
14. Walker, M. L. R., Gallimore, A. D., "**Neutral Density Map of Hall Thruster Plume Expansion in a Vacuum Chamber**," Review of Scientific Instruments, Volume 76, Number 5, May 2005.
15. Walker, M. L. R., Gallimore, A. D., Cai, C., Body, I. D., "**Vacuum Chamber Pressure Maps of a Hall Thruster Cold Flow Expansion**," Journal of Propulsion and Power, Volume 20, Number 6, Nov.-Dec. 2004.

Conference Papers:

1. Williams, L., Walker, M. L. R., Kumsomboone, V. S., Ready, W. J., "**Experimental Characterization of Carbon Nanotube Cold Cathode Lifetime Operation**", 45th Joint Propulsion Conference, Denver, CO, August 2-5, 2009.
2. Carlsson, J., Pavarin, D., Walker, M., "**Analytic Wave Solution with Helicon and Trivelpiece-Gould Modes in an Annular Plasma**", B61, 18th Topical Conference on Radio Frequency Power in Plasmas, Gent, Belgium, June 24-26, 2009.
3. Williams, L., Walker, M. L. R., "**Experimental Characterization of a Carbon Nanotube Field Emission Cathode**", AIAA-2008-5015, 44th Joint Propulsion Conference, Hartford, CT, July 20-23, 2008.
4. Palmer, D., Walker, M. L. R., "**Performance of an Annular Helicon Plasma Source**", AIAA-2008-4926, 44th Joint Propulsion Conference, Hartford, CT, July 20-23, 2008.
5. Palmer, D., Walker, M. L. R., Manente, M., Carlsson, J., Bramanti, C., Pavarin, D., "**Experimental Analysis of a Low-Power Helicon Thruster**", AIAA-2008-4925, 44th Joint Propulsion Conference, Hartford, CT, July 20-23, 2008.
6. Pavarin, D., Manente, M., Walker, M. L. R., Palmer, D., Carlsson, J., Bramanti, C., Saggin, B., "**Feasibility Study of a Medium-Power Helicon Thruster**", AIAA-2008-4927, 44th Joint Propulsion Conference, Hartford, CT, July 20-23, 2008.
7. King, S. T., Walker, M. L. R., Kluever, C. A., "**Small Satellite LEO Maneuvers with Low-Power Electric Propulsion**", AIAA-2008-4516, 44th Joint Propulsion Conference, Hartford, CT, July 20-23, 2008.
8. Palmer, D., Walker, M. L. R., Manente, M., Carlsson, J., Bramanti, C., Pavarin, D., "**Experimental Analysis of Low-Power Helicon Thruster**", 5th International Spacecraft Propulsion Conference, Crete, Greece, May 5-9, 2008.
9. Manente, M., Walker, M. L. R., Carlsson, J., Bramanti, C., Pavarin, D., "**Feasibility Study of Low-Power Helicon Thruster**", 5th International Spacecraft Propulsion Conference, Crete, Greece, May 5-9, 2008.

10. Palmer, D., Akinli, C., Walker, M. L. R., “**Characterization of an Annular Helicon Plasma Source**”, IEPC-2007-202, 30th International Electric Propulsion Conference, Florence, Italy, September 17-20, 2007.
11. Akinli, C., Palmer, D., Walker, M. L. R., “**Comparison of the Theoretical and Experimental Performance of an Annular Helicon Plasma Source**”, IEPC-2007-0236, 30th International Electric Propulsion Conference, Florence, Italy, September 17-20, 2007.
12. Stubbers, R., Jurczyk, B. E., Rovey, J. L., Walker, M. L. R., Alman, D. A. Coventry, M. D., “**Compact Toroid Formation Using an Annular Helicon Preionization Source**”, AIAA-2007-5307, 43rd Joint Propulsion Conference, Cincinnati, OH, July 8-11, 2007.
13. Yano, M., Williams, L., Walker, M. L. R. “**Design and Operation of an Annular Helicon Plasma Source**”, AIAA-2007-5309, 43rd Joint Propulsion Conference, Cincinnati, OH, July 8-11, 2007.
14. Gilland, J. H., Walker, M. L. R., Pencil, E. J., “**Thrust Stand for Applied Field MPD Thrusters**”, IEPC-2005-215, 29th International Electric Propulsion Conference, Princeton, NJ, Oct. 31-Nov. 4, 2005.
15. Walker, M. L. R., Gallimore, A. D., “**Performance Characteristics of a Cluster of 5 kW Laboratory Hall Thrusters**”, AIAA-2004-3767, 40th Joint Propulsion Conference, Fort Lauderdale, FL, July 11-14, 2004.
16. Rovey, J. L., Walker, M. L. R., Gallimore, A. D., Peterson, P. Y., “**Evaluation of a Magnetically-Filtered Faraday Probe for measuring the ion current density profile of a Hall thruster**,” AIAA-2004-3948, 40th Joint Propulsion Conference, Fort Lauderdale, FL, July 11-14, 2004.
17. Walker, M. L. R., Gallimore, A. D., “**Hot Flow Pressure Map of a Vacuum Facility as a Function of Flow Rate to Study Facility Effects**,” IEPC-0077-03, 28th International Electric Propulsion Conference, Toulouse, France, March 17-21, 2003.
18. Walker, M. L. R., Gallimore, A. D., Cai, C., Body, I. D., “**Pressure Map of a Facility as a Function of Flow Rate to Study Facility Effects**,” AIAA-2002-3815, 38th Joint Propulsion Conference, Indianapolis, IN, July 7-10, 2002.
19. Walker, M. L. R., Hofer, R. R., Gallimore, A. D., “**The Effects of Nude Faraday Probe Design and Vacuum Facility Backpressure on the Measured Ion Current Density Profile of Hall Thruster Plumes**,” AIAA-2002-4253, 38th Joint Propulsion Conference, Indianapolis, IN, July 7-10, 2002.
20. Boyd, I. D., Cai, C., Walker, M. L. R., Gallimore, A. D., “**Computation of Neutral Gas Flow of a Hall Thruster into a Vacuum Chamber**,” 23rd International Symposium on Rarefied Gas Dynamics, Whistler, British Columbia, July 20-25, 2002.
21. Hofer, R. R., Walker, M. L. R., Gallimore, A. D., “**A Comparison of Nude and Collimated Faraday Probes for Use with Hall Thrusters**,” IEPC-01-020, 27th International Electric Propulsion Conference, Pasadena, CA, October 15-19, 2001.

Other Publications:

1. Walker, M. L. R., “**Electric Propulsion**,” Aerospace America, No. 12, December 15, 2005, pp. 54-55.
2. Palmer, D., Yano, M., Beal, B., Walker, M. L. R., “**Characterization of Annular and Cylindrical Helicon Sources**,” 9th International Workshop on the Interrelationship between Plasma Experiments in Laboratory and Space, Cairns, Australia, August 5-8, 2007.

Invited Presentations:

1. Walker, M. L. R., “High Thrust-to-Power Hall Thrusters,” Purdue University, April 7, 2008 – Invited.
2. Walker, M. L. R., “High Thrust-to-Power Hall Thrusters,” Virginia Tech, February 25, 2008 – Invited.
3. Sharma, J., Walker, M. L. R., “START: Utilizing Near-Earth Asteroids with Tether Technologies,” NASA Institute of Advanced Concepts, Atlanta, GA, March 7, 2007.

4. “Electric Propulsion Research Activities at the University of Michigan” at the University of Pisa, Sept. 2003.

Courses Taught:

Low-speed Aerodynamics (AE 2020)
Thermodynamics and Compressible Flow (AE 3450)
Jet and Rocket Propulsion (AE 4451)
Gasdynamics (AE 6050)
Rockets (AE 6450)
Electric Propulsion (AE 6451)

Teaching Interests:

Aerospace Propulsion, Gas Dynamics, Viscous Flows, Low-speed Aerodynamics

Awards & Honors:

- Air Force Office of Scientific Research Young Investigator Program Award, 2006
- NASA Faculty Fellow, 2005
- Class of 1969 Teaching Fellow, 2005
- Who's Who in Engineering Education, 2005
- Arnold M. Kuethe Aerospace Engineering Fellowship, 2004
- MEPO Academic Achievement Award, University of Michigan, 2001
- Michigan Space Grant Consortium Graduate Fellowship, 2001, 2003
- Rackham Merit Fellowship, University of Michigan (NSF sponsored), 2000
- GEM Fellowship, 1999
- Aerospace Engineering Distinguished Achievement Award, University of Michigan, 1998
- Lockheed Martin Scholar, 1997-99
- Five Term Angell Scholar, University of Michigan (1997-2000, consecutive semesters with all As)
- National Dean's List, 1995-99
- Dean's List, University of Michigan, 1995-99
- University of Michigan Scholar Recognition Award, 1995
- Groesbeck Honorary Engineering Scholarship, University of Michigan College of Engineering Scholarship, Regents Alumni Scholarship

Service:

- Student Panelist: University of Michigan Office of Student Conflict Resolution, 2004
- Supervised Master's Thesis Student from the University of Stuttgart, Germany, 2003
- Judge for Science and Engineering Fair of Metropolitan Detroit, 2003
- On-site Coordinator for University of Michigan LeaderShape Program, 2003
- NASA SHARP Mentorship Program, 2004
- Michigan Mentorship Program, 2002, 2003
- UROP Mentor – Mentored Undergraduate Research Assistant, 2002
- University of Michigan Marching Band 1995-98, Rank Leader 1997, 1998

Professional and Honor Societies:

- AIAA Senior Member, Electric Propulsion Technical Committee
- Electric Rocket Propulsion Society
- American Society for Engineering Education (ASEE)
- American Society of Mechanical Engineers (ASME)
- Tau Beta Pi

- Sigma Gamma Tau
- Golden Key National Honor Society
- Phi Kappa Phi National Honor Society
- Kappa Kappa Psi (Honorary Music Fraternity)

Other Interests:

- R/C airplane design and construction, Rebuild 2 & 4 cycle engines, Teaching instrumental music