
Education

Stanford University, Stanford, CA
Ph.D., Department of Aeronautics and Astronautics, March 2006
Dissertation title: State Estimation for Autonomous Flight in Cluttered Environments
Advisor: Professor Stephen Rock, Department of Aeronautics and Astronautics
University of Washington, Seattle, Washington
Master of Science in Aeronautics and Astronautics, December 1994.
Thesis title: Design Oriented Structural Analysis for Shape Optimization of Isotropic and Composite Fuselage Structures
Advisor: Professor Eli Livne, Department of Aeronautics and Astronautics
Queen's University, Kingston, Ontario.
Bachelor of Science, Engineering Physics (Mechanical Option), with Honors, 1992

Research and Professional Experience

2012—present: Associate Professor, Aerospace Engineering, The Pennsylvania State University, University Park, Pennsylvania.
2006—2012: Assistant Professor, Aerospace Engineering, The Pennsylvania State University, University Park, Pennsylvania.
2000—2006: Research Assistant, Aerospace Robotics Laboratory, Department of Aeronautics and Astronautics, Stanford University, Stanford, California.
1995—2000: Engineer, Bombardier Aerospace (formerly de Havilland Inc.), Downsview, Ontario Canada.
1994—1995: Research Assistant, Department of Aeronautics and Astronautics, University of Washington, Seattle, Washington.

Professional Memberships and Service

Professional Engineer, Association of Professional Engineers of Ontario since 1996.
Associate Fellow (2011), American Institute of Aeronautics and Astronautics. Member of Guidance, Navigation and Control Technical Committee. Chair of Education sub-committee, 2007-2010.
Member, American Society for Engineering Education
Member, Institute for Electrical and Electronics Engineers. Session organizer and co-chair (Autonomous Vehicles), 2006 and 2007 IEEE Aerospace Conference, Big Sky, MT.
Reviewer: AIAA Journal of Guidance, Control and Dynamics; International Journal of Robotics Research; IEEE Transactions on Control System Technology; IEEE Transactions on Robotics; Journal of Intelligent Robots and Systems; IEEE Conference on Decision and Control; AIAA Guidance, Navigation and Control Conference; IEEE/RSJ International Conference on Intelligent Robots and Systems; IEEE Conference on Robotics and Automation; IEEE Multi-Conference on Systems and Control; American Control Conference
Grant Proposal Peer Review: National Science Foundation Robust Intelligence Cluster “small proposals” panel, 2009, 2008, 2007; Army Research Office, 2009, Office of Naval Research, 2010

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Conference Organization: Technical Area co-chair, 2008 AIAA Guidance, Navigation and Control Conference; Technical Area Chair, 2009, 2010, 2011 AIAA Guidance, Navigation and Control Conference; Technical co-Chair, 2012 AIAA Guidance, Navigation and Control Conference; Organizing Committee, 2010 National Academy of Engineering United States Frontiers of Engineering (USFOE) Conference.

Honors and Awards

2014: Winner of OSTIV Diploma for best paper presented at the XXXI OSTIV Congress and published in the Journal of Technical Soaring, vol. 37, no. 3, July 2013. (OSTIV is the Organization Scientifique et Technique International du Vol à Voile).

2011: Winner of a NASA Centennial Challenge. Team Leader of Pipistrel-USA.com, winner of the Green Flight Challenge. Our four seat, electric powered aircraft flew 403 passenger miles per gallon over a 195 mile course at 107 miles per hour. The prize of \$1.35Million is the largest ever awarded for an achievement in aviation.

2011: Associate Fellow, American Institute of Aeronautics and Astronautics.

2010: PSEAS Outstanding Teaching Award (awarded by the Penn State Engineering Alumni Society).

2008: National Science Foundation Faculty Early Career Development Program (CAREER) award

2006-2008: Dorothy Quiggle Professor in Engineering, The Pennsylvania State University.

2001-2004: Alyce B. and Henry J. Ramey Jr. Fellow, Stanford University.

2000: Department Fellowship, Department of Aeronautics and Astronautics, Stanford University.

Teaching

AERSP 306 (Introduction to Aeronautics): Spring 2012, Spring 2010.

AERSP 402A (Aircraft Design, Preliminary): Fall 2013, Fall 2012.

AERSP 402B (Aircraft Design, Detailed): Spring 2013, Spring 2012.

AERSP 413 (Aircraft Stability and Control): Fall 2008.

AERSP 460 (Control of Aerospace Systems): Fall 2012, Fall 2010, Fall 2009, Fall 2007, Fall 2006.

AERSP 497D/597D (AUV Design): Fall 2013, Spring 2014, Fall 2014

AERSP 597E (Estimation Theory): Spring 2013, Spring 2011, Spring 2008.

AERSP 597G (Theory and Application of Global Navigation Satellite Systems): Fall 2011, Spring 2009, Spring 2007.

Invited Publications

- [1] Jack W. Langelaan and Nicholas Roy, "Enabling New Missions for Robotic Aircraft," *Science*, vol. 326, no. 5960, December 18, 2009, pp. 1642-1644, DOI: 10.1126/science.1182497

Refereed Journal Publications

- [17] Depenbusch, N. T., John J. Bird and Jack W. Langelaan, "The AutoSOAR Autonomous Soaring Aircraft Part 2: Hardware Implementation and Flight Results," under review, *Journal of Field Robotics*
- [16] Depenbusch, N. T., John J. Bird and Jack W. Langelaan, "The AutoSOAR Autonomous Soaring Aircraft Part 1: Autonomy Algorithms," under review, *Journal of Field Robotics*
- [15] Thanan Yomchinda, Jack W. Langelaan and Joseph F. Horn, "Modified Dubins Parameterization for Aircraft Emergency Trajectory Planning," *Proceedings of the Institution of Mechanical Engineers Part G: Journal of Aerospace Engineering* 03/2016; DOI:10.1177/0954410016638869
- [14] Nicholas Grande, Shane Tierney, Joseph F. Horn and Jack W. Langelaan, "Safe Autorotation through Wind Shear via Backwards Reachable Sets," *Journal of the American Helicopter Society*, vol. 61, no. 2, April 2016.
- [13] Jason G. Mandell, Jack W. Langelaan, Andrew G. Webb, and Steven J. Schiff, "Volumetric brain analysis in neurosurgery: Part I. Particle filter segmentation of brain and cerebrospinal fluid growth dynamics from MRI and CT images," *Journal of Neurosurgery: Pediatrics*, vol. 15, no. 2, February 2015, pp 113-124 doi: 10.3171/2014.9.PEDS12426
- [12] Bird, John J. and Jack W. Langelaan, "Spline Mapping to Maximize Energy Exploitation of Non-Uniform Thermals," *Journal of Technical Soaring*, vol. 37, no. 3, July-September 2013. First author is student supervised by candidate. This paper won the 2014 OSTIV Diploma.
- [11] Langelaan, J. W., Anjan Chakrabarty, Aijun Deng, Kirk Miles, Vid Plevnik, Jure Tomazic, Tine Tomazic, Gregor Veble, "Green Flight Challenge: Aircraft Design and Flight Planning for Extreme Fuel Efficiency," *Journal of Aircraft*, vol. 50, no. 3, May 2013, pp 832-846, doi: 10.2514/1.C032022
- [10] Tine Tomažič, Vid Plevnik, Gregor Veble, Jure Tomažič, Franc Popit, Sašo Kolar, Radivoj Kikelj, Jacob W Langelaan, Kirk Miles, "Pipistrel Taurus G4: on Creation and Evolution of the Winning Aeroplane of NASA Green Flight Challenge 2011," *Strojniški vestnik-Journal of Mechanical Engineering*, vol. 57, no. 12, 2012, pp 869-878.
- [9] Anjan Chakrabarty and Jack W. Langelaan, "Energy-based Long-Range Path Planning for Soaring-capable UAVs," *Journal of Guidance, Control and Dynamics*, vol. 34, no. 4, 2011, pp 1002-1015. *First author is student supervised by Langelaan.*
- [8] Jack W. Langelaan, Nicholas J. Alley, and James Neidhoefer, "Wind Field Estimation for Mini- and Micro-Unmanned Aerial Vehicles," *Journal of Guidance, Control and Dynamics*, vol. 34, no. 4, 2011, pp 1016-1030.
- [7] Jack W. Langelaan, "A Gust Soaring Controller for Small Gliders," *Journal of Technical Soaring*, vol. 35, no. 2, 2011.
- [6] Sean Q. Marlow and Jack W. Langelaan, "Local Terrain Mapping for Obstacle Avoidance using Monocular Vision," *Journal of the American Helicopter Society*, vol. 56, no. 2, April 2011.
- [5] Jeffrey B. Corbets and Jack W. Langelaan, "Real Time Trajectory Generation for Target Localization using Micro Air Vehicles," *Journal of Aerospace Computing, Information and Communications*, vol. 7, August 2010, pp 223-240, doi: 10.2514/1.47834. *First author is student supervised by Langelaan.*
- [4] Jack W. Langelaan, "Gust Energy Extraction for Small- and Micro- Uninhabited Aerial Vehicles," *Journal of Guidance, Control and Dynamics*, vol. 32, no. 2, 2009, pp 464-473.

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- [3] Jack W. Langelaan, "State Estimation for Autonomous Flight in Cluttered Environments," *Journal of Guidance, Control and Dynamics*, vol. 30, no. 5, 2007.
- [2] Jack Langelaan, ed.: "Special Issue on Aircraft Design and Development," *Canadian Aeronautics and Space Journal* vol. 46, no. 2 June 2000.
- [1] J. W. Langelaan and E. Livne: "Analytic Sensitivities and Design Oriented Structural Analysis for Airplane Fuselage Shape Synthesis," *Computers and Structures*, vol. 62, no. 3, pp. 505–519, 1997.

Book Chapters

- [1] Jack W. Langelaan, "Power Generation and Energy Management," in *Encyclopedia of Aerospace Engineering: UAS*, online June 13, 2016
doi: 10.1002/9780470686652.eae1113

Conference Publications

- [45] Langelaan, J.W., Sven Schmitz, Jose Palacios and Ralph D. Lorenz, "Energetics of rotary-wing exploration of Titan," *IEEE Aerospace Conference*, Big Sky, Montana, March 6-10, 2017.
- [44] Geng, Junyi and Jack W. Langelaan, "A Quasi Polar Local Occupancy Grid Approach for Vision-based Obstacle Avoidance," *Proceedings of the AIAA Guidance, Navigation and Control Conference*, Grapevine, Texas, January 9-13, 2017.
- [43] Holmes, W. K. and Jack W. Langelaan, "Autonomous Ship-board Landing using Monocular Vision," *Proceedings of the American Helicopter Society 72nd Annual Forum*, West Palm Beach, Florida, May 2016.
- [43] Jerath, K. and Jack W. Langelaan, "Simulation framework for incorporating sensor systems in UAS conceptual design," *Proceedings of the AIAA Modeling and Simulation Technologies Conference*, San Diego, California, January 4-8 2016.
- [42] Enciu, J., Joseph F. Horn, and Jack W. Langelaan, "Formation control of a rotorcraft multi-lift system," *41st European Rotorcraft Forum*, 2015.
- [41] Depenbusch, N., Constantino Lagoa, and Jack W Langelaan, "Random Geometric Graphs as a Model for Bounding the Endurance of Soaring Aircraft," *IEEE Conference on Decision and Control*, Los Angeles, California, December 2014.
- [40] Cheng, K. and Jack W. Langelaan, "Guided Exploration for Coordinated Autonomous Soaring Flight," *Proceedings of the AIAA Guidance, Navigation and Control Conference*, National Harbor, Maryland, January 13-17 2014.
- [39] Li, Z., Jack W. Langelaan and Joseph F. Horn, "Coordinated Transport of a Slung Load by a Team of Autonomous Rotorcraft," *Proceedings of the AIAA Guidance, Navigation and Control Conference*, National Harbor, Maryland, January 13-17 2014.
- [38] Makovkin, D. and Jack W. Langelaan, "Optimal Persistent Surveillance using Coordinated Soaring," *Proceedings of the AIAA Guidance, Navigation and Control Conference*, National Harbor, Maryland, January 13-17 2014.
- [37] Bird, J., Jack W. Langelaan, Corey Montella, John Spletzer, Joachim Grenestedt, "Closing the Loop in Dynamic Soaring," *Proceedings of the AIAA Guidance, Navigation and Control Conference*, National Harbor, Maryland, January 13-17 2014.
- [36] Daugherty, S. and Jack W. Langelaan, "Improving Autonomous Soaring via Energy State Estimation and Extremum Seeking Control," *Proceedings of the AIAA Guidance, Navigation and Control Conference*, National Harbor, Maryland, January 13-17 2014.

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- [35] Depenbusch, N. and Jack W. Langelaan, "Minimum Risk Planning for Teams of Unmanned Air Vehicles," *Proceedings of the 2013 Infotech@Aerospace Conference*, Boston, Massachusetts, August 19-22, 2013. (invited paper).
- [34] Chakrabarty, A. and Jack W. Langelaan, "UAV Flight Path Planning in Time Varying Complex Wind Fields," *American Control Conference*, Washington, DC, June 2013.
- [33] Grande, N. and Jack W. Langelaan, "Safe Autonomous Flare and Landing during Autorotation through Wind Shear," *Proceedings of the AHS 69th Annual Forum*, Phoenix, Arizona, May 21-23, 2013.
- [32] Truskin, B. and Jack W. Langelaan, "Vision-based Deck State Estimation for Autonomous Ship-board Landing," *Proceedings of the AHS 69th Annual Forum*, Phoenix, Arizona, May 21-23, 2013.
- [31] Song, Y., Joseph F. Horn, ZuQun Li, and Jack W. Langelaan, "Modeling, Simulation, and Non-linear Control of a Rotorcraft Multi-Lift System," *Proceedings of the AHS 69th Annual Forum*, Phoenix, Arizona, May 21-23, 2013.
- [30] Quindlen, J. and J. W. Langelaan, "Flush Air Data Sensing for Soaring-capable UAVs," 51st AIAA Aerospace Sciences Meeting including the New Horizons Forum and Aerospace Exposition, 2013, 10.2514/6.2013-1153.
- [29] John J. Bird and Jack W. Langelaan, "Spline Mapping to Maximize Energy Exploitation of Non-uniform Thermals," *Proceedings of the XXXI OSTIV Congress*, Uvalde, Texas, August 8-13, 2012. *First author is student supervised by Langelaan.*
- [28] Langelaan, J. W., J. Spletzer, C. Montella and J. Grenestedt, "Wind field estimation for autonomous dynamic soaring," *2012 IEEE International Conference on Robotics and Automation*, St. Paul, Minnesota, May 14-18 2012.
- [26] Thanan Yomchinda, Joseph F. Horn and Jack W. Langelaan, "Autonomous Control and Path Planning for Autorotation of Unmanned Helicopters," *American Helicopter Society 68th Annual Forum*, Fort Worth, Texas. May 1-3, 2012
- [26] Marlow, S. Q. and Jack W. Langelaan, "Population of a Range Bearing Map for Local Obstacle Avoidance Using Monocular Vision," *American Astronautical Society Guidance and Control Conference*, Breckenridge, Colorado, 2012.
- [25] Thanan Yomchinda, Joseph F. Horn and Jack W. Langelaan, "Flight Path Planning for Descent-phase Helicopter Autorotation," *AIAA Guidance, Navigation and Controls Conference*, Portland, Oregon, August 7-11 2011.
- [24] Nathan T. Depenbusch and Jack W. Langelaan, "Coordinated Mapping and Exploration for Autonomous Soaring," *AIAA Infotech@Aerospace Conference*, St. Louis, Missouri, March 29-31 2011. *First author is student supervised by Langelaan.*
- [23] Jack W. Langelaan, Nicholas Alley and James Niedhoefer, "Wind Field Estimation for Small Unmanned Aerial Vehicles," *AIAA Guidance, Navigation and Controls Conference*, Toronto, Canada, August 2010.
- [22] Nathan T. Depenbusch and Jack W. Langelaan, "Receding Horizon Control for Atmospheric Energy Harvesting by Small UAVs," *AIAA Guidance, Navigation and Controls Conference*, Toronto, Canada, August 2010. *First author is student supervised by Langelaan.*
- [21] Anjan Chakrabarty and Jack W. Langelaan, "Flight Path Planning for UAV Atmospheric Energy Harvesting Using Heuristic Search," *AIAA Guidance, Navigation and Controls Conference*, Toronto, Canada, August 2010. *First author is student supervised by Langelaan.*

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- [20] Sean Quinn Marlow and Jack W. Langelaan, "Dynamically Sized Occupancy Grids for Obstacle Avoidance," *AIAA Guidance, Navigation and Controls Conference*, Toronto, Canada, August 2010. *First author is student supervised by Langelaan.*
- [19] Adam J. Dean, Jack W. Langelaan, and Sean N. Brennan, "Improvements in Terrain-Based Road Vehicle Localization By Initializing an Unscented Kalman Filter Using Particle Filters." *2010 American Control Conference*, Baltimore, Maryland, June 2010.
- [18] Shane Tierney and Jack W. Langelaan, "Autorotation Path Planning Using Backwards Reachable Sets and Optimal Control," *American Helicopter Society 66th Annual Forum*, Phoenix, Arizona, May 2010. *First author is student supervised by Langelaan.*
- [17] C. W. Jemmott, L.J. Culver, and J.W. Langelaan, "Comparison of Particle Filter and Histogram Filter for Passive Sonar Localization," *Proceedings of Meetings on Acoustics*, vol. 8, issue 1, December 22, 2009. <http://dx.doi.org/10.1121/1.3292596>
- [16] Adam J. Dean, Jack W. Langelaan, and Sean N. Brennan, "Initializing an Unscented Kalman Filter using a Particle Filter," *Dynamic Systems and Control Conference*, Hollywood, California, October 2009.
- [15] Anjan Chakrabarty and Jack W. Langelaan, "Energy Maps for Long Range Path Planning for Small- and Micro- UAVs," *AIAA Guidance, Navigation and Controls Conference*, Chicago, Illinois, August, 2009. *First author is student supervised by Langelaan.*
- [14] Sean Quinn Marlow and Jack W. Langelaan, "Local Terrain Mapping for Obstacle Avoidance using Monocular Vision," *AHS International Specialist's Meeting on Unmanned Rotorcraft*, Scottsdale, Arizona, January 2009. *First author is student supervised by Langelaan.*
- [13] Sana Sarfraz and Jack W. Langelaan, "Autonomous Ground-Based Tracking of Migrating Raptors using Vision," *AIAA Guidance, Navigation and Controls Conference (invited paper)*, Honolulu, Hawaii, August 2008. *First author is student supervised by Langelaan.*
- [12] Jack W. Langelaan, "Biologically Inspired Flight Techniques for Small and Micro Unmanned Aerial Vehicles," *AIAA Guidance, Navigation and Controls Conference*, Honolulu, Hawaii, August 2008.
- [11] Jack W. Langelaan, "Tree-based Trajectory Planning to Exploit Atmospheric Energy," *American Control Conference*, Seattle, Washington, June 2008.
- [10] Jeffrey B. Corbets and Jack W. Langelaan, "Parameterized Trajectories for Target Localization using Small- and Micro- Unmanned Aerial Vehicles," *American Control Conference*, Seattle, Washington, June 2008. *First author is student supervised by Langelaan.*
- [9] Jack W. Langelaan and Goetz Bramesfeld, "Gust Energy Extraction for Small and Micro Uninhabited Aerial Vehicles," *46th AIAA Aerospace Sciences Meeting*, Reno, Nevada, January 2008.
- [8] Jack W. Langelaan, "Long Distance/Duration Trajectory Optimization for Small UAVs," *AIAA Guidance, Navigation and Controls Conference*, Hilton Head, South Carolina, August 2007.
- [7] Eric W. Frew, Jack Langelaan, Maciej Stachura, "Adaptive Planning Horizon Based on Information Velocity for Vision-Based Navigation and Active Sensing," *invited to AIAA Guidance, Navigation and Controls Conference*, Hilton Head, South Carolina, August 2007.

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- [6] Jeffrey B. Corbets and Jack W. Langelaan, "Parameterized Optimal Trajectory Generation for Target Localization," *invited to AIAA Guidance, Navigation and Controls Conference*, Hilton Head, South Carolina, August 2007. *First author is student supervised by Langelaan.*
- [5] Eric Frew, Jack Langelaan and Sungmoon Joo, "Adaptive Receding Horizon Control for Vision-Based Navigation of Small Unmanned Aircraft," *invited to American Controls Conference*, Minneapolis, Minnesota, 2006.
- [4] Jack Langelaan and Steve Rock, "Towards Autonomous UAV Flight in Forests," *AIAA Guidance, Navigation and Control Conference*, San Francisco, California, 2005.
- [3] Jack Langelaan and Steve Rock, "Passive GPS-Free Navigation for Small UAVs," *IEEE Aerospace Conference*, Big Sky, Montana 2005.
- [2] Jack Langelaan and Steve Rock, "Navigation of Small UAVs Operating in Forests," *AIAA Guidance, Navigation and Control Conference*, Providence, Rhode Island, 2004.
- [1] Jack W. Langelaan and Leo J. J. Kok: "Damage Tolerance Modelling of Fibre/Metal Laminate Fuselage Structures," *AIAA Paper 97-1400, 38th Structures, Structural Dynamics and Materials Conference*, Kissimmee, Florida, 1997.

Seminars and speaking engagements

- [26] "Algorithms, Implementation, and Flight Test Results of the AutoSOAR Platform," Centre for Aerial Robotics Research and Education, University of Toronto, January 2017.
- [25] "Cooperative Transport of Slung Loads by Teams of Autonomous Rotorcraft," University of Michigan, January 2015.
- [24] "Coordination Strategies for Autonomous Soaring," University of Toronto Institute for Aerospace Studies, October 2014.
- [23] "Coordination Strategies for Autonomous Soaring," Ohio State University, October 2014.
- [22] "Progress in Autonomous Soaring," Naval Research Lab, September 2014
- [21] "Risks and Opportunities: Flying Drones," Excess Casualty Claims Seminar, New York, NY, September 2014
- [20] "Extreme Flight Efficiency: The Taurus G4 and the Green Flight Challenge," Virginia Tech Department of Aerospace and Ocean Engineering, November 4, 2012.
- [19] "Extreme Flight Efficiency: The Taurus G4 and the Green Flight Challenge," University of Illinois Department of Aerospace Engineering, September 26, 2012.
- [18] "Extreme Flight Efficiency: The Taurus G4 and the Green Flight Challenge," Stanford University Department of Aeronautics and Astronautics, April 25, 2012.
- [17] "Dawn of the Electric Age: The Taurus G4, the Green Flight Challenge and the Promise of Electric Powered Flight," NASA Ames Research Center, April 25, 2012
- [16] "The Advent of Flight's Electric Age," presentation to Collier Trophy Selection Committee, March 12, 2012
- [15] "The Advent of Green and Affordable Personal Air Travel," TEDxPSU, November 13, 2011 (<http://www.youtube.com/watch?v=rA7o9eMhsjw>)
- [14] "Electric Flight Research Panel," member of panel discussing teaching and research issues in electric aviation, 2010 EAA AirVenture, Oshkosh, Wisconsin, July 29, 2010
- [13] "Enabling Long-duration Missions for Small UAVs," Lehigh University Department of Mechanical Engineering, April 22, 2010.

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- [12] "Enabling Long-duration Missions for Small UAVs," Stanford University Department of Aeronautics and Astronautics, Stanford, California, February 17, 2010.
- [11] "Vision-based obstacle avoidance for small unmanned rotorcraft," AMRDEC, NASA Ames Research Center, Moffet Field, California, July 23, 2009.
- [10] "Autonomous Soaring Flight for Small and Micro UAVs," Intelligent Systems Division, NASA Ames Research Center, Moffet Field, California, July 22, 2009.
- [9] "Autonomous Soaring Flight for Small and Micro UAVs," University of Colorado Aerospace Engineering Sciences, October 28, 2008.
- [8] "Integrated Symbolic/Continuous Trajectory Planning for Safe Landing under Restricted Flight Envelopes", NASA Ames, March 6, 2008.
- [7] "Biologically Inspired Flight Techniques for Small- and Micro- Unmanned Aerial Vehicles", Stanford University Department of Aeronautics and Astronautics, March 5, 2008.
- [6] "Vision Aided State Estimation for Autonomous Flight in Cluttered Environments", AFRL/VACA, Wright-Patterson AFB, November 28, 2006.
- [5] "Vision Aided State Estimation for Autonomous Flight in Cluttered Environments", Department of Aerospace and Ocean Engineering, Virginia Tech, Blacksburg, VA. November 13, 2006.
- [4] "Towards Autonomous UAV Flight in Forests", Department of Aerospace Engineering, Pennsylvania State University, State College, PA. November 15, 2005.
- [3] "Towards Autonomous UAV Flight in Forests", MDA Space Missions, Brampton, Ontario. June 22, 2005.
- [2] "Towards Autonomous UAV Flight in Forests", University of Toronto Institute for Aerospace Studies, Toronto, Ontario. June 20, 2005.
- [1] "Autonomous Navigation of Small UAVs in Unknown Environments", Mechatronics Division, Department of Mechanical Engineering, University of Waterloo, Waterloo, Ontario. March 24, 2005.