Curriculum Vitae

Roy J. Hartfield, Jr.
Walt and Virginia Woltosz Professor
Aerospace Engineering
211 Davis Hall
Auburn University
Auburn, AL 36849-5338

Telephone: (334) 844-6819 (work)
334 444 8523 (cell)
(334) 826-8919 (home)
Fax: (334) 844-6803
email:
rjh@eng.auburn.edu
website:
http://www.eng.auburn.edu/users/hartfrj/

EDUCATION

1989 - 1990	PhD., Mechanical and Aerospace Engineering, University of Virginia, Charlottesville, Virginia
1986 - 1989	Master's Degree, Mechanical and Aerospace Engineering, University of Virginia, Charlottesville, Virginia
1981 - 1985	B. S., Physics, University of Southern Mississippi, Hattiesburg, Mississippi

APPOINTMENTS

1990-1996	Assistant Professor, Aerospace Engineering, Auburn University
1996-2007	Associate Professor, Aerospace Engineering, Auburn University
2007-2010	Professor, Aerospace Engineering, Auburn University
2010-present	Walt and Virginia Woltosz Professor, Aerospace Engineering, Auburn University
2017 – present	Assistant Chair, Aerospace Engineering, Auburn University

PROFESSIONAL ORGANIZATIONS

American Society of Mechanical Engineers (ASME)
American Institute of Aeronautics and Astronautics (AIAA)
Member of the AIAA High Speed Airbreathing Propulsion Technical Committee (2008 – present)
Member of the ASME Propulsion Technical Committee, 2008-2010
Member: Applied Aerodynamics (APA) Technical Committee, AIAA, 2004-2008.

HONORS

Fellow, ASME
Associate Fellow, AIAA
Herman Oberth Award, AIAA Huntsville Section, 2018

CLEARANCE
Secret

REFEREED JOURNAL ARTICLES

Little, D., Majdalani, J., Hartfield, R., and Ahuja,V., "On the prediction of noise generated by urban air mobility (UAM) vehicles. Part 1. Integration of fundamental acoustic metrics" Accepted for publication in "Physics of Fluids," DOI: DOI: 10.1063/5.0105002

Ahuja,V., Little, D., Majdalani, J., and Hartfield, R., "On the prediction of noise generated by urban air mobility (UAM) vehicles. Part 2. Implementation of the Farassat F1A formulation into a modern surface-vorticity panel solver," Accepted for publication in "Physics of Fluids," DOI: 10.1063/5.0124134.

Griffin A. DiMaggio, Roy J. Hartfield Jr., Joseph Majdalani, and Vivek Ahuja, "Solid rocket motor internal ballistics using an enhanced surface-vorticity panel technique", Physics of Fluids 33, 103613 (October, 2021) https://doi.org/10.1063/5.0069075

Vivek Ahuja, Roy J. Hartfield, and John E. Cochran Jr.. "Solutions to the Aerodynamics-Driven Inverse Guidance Problem", Journal of Spacecraft and Rockets, Vol. 53, No. 4 (2016), pp. 774-781.

Vivek Ahuja and R. J. Hartfield. "Aerodynamic Loads over Arbitrary Bodies by Method of Integrated Circulation", Journal of Aircraft, Vol. 53, No. 6 (2016), pp. 1719-1730.

Ahuja, V. and Hartfield, R. J., "Optimization of Scramjet Combustor Geometries Using Genetic Algorithms," Journal of Propulsion and Power, Vol. 31, No. 5 (2015), pp. 1481-1485.

Ahuja, V. and Hartfield, R. J., "Optimization of Combined Rocket and Ramjet/Scramjet Ballistic Missile Designs", Journal of Propulsion and Power, Vol. 31, No. 6 (2015), pp. 1544-1550.

Albarado, K., Ledlow, T., and Hartfield, R., "Alternative Analysis Networking: A Multi-Characterization Algorithm" Journal of Computing and Information Science In Engineering, Vol. 17, No. 1, Jan-Feb. 2015, pp. 54-63.

Ahuja, V., Hartfield, R., and Shelton, A., Optimization of Hypersonic Aircraft Using Genetic Algorithms" Applied Mathematics and Computation, Vol. 242, September 2014, pp. 423-434.

Badyrka, Jeff, Hartfield, Roy, and Jenkins, Rhonald, "Aerospace Design Optimization Using a Compound Repulsive Particle Swarm," Applied Mathematics and Computation, Volume 219, Issue 15, 1 April 2013, Pages 8311–8331.

Albarado, Kevin, Hartfield, Roy, Hurston, Benjamin, and Jenkins, Rhonald, "Solid Rocket Motor Performance Matching Using Pattern Search/Particle Swarm Optimization," Volume 2012 (2012), Article ID 987402, International Journal of Aerospace Engineering, April, 2012.

Jenkins, Rhonald, and Hartfield, Roy, "Hybrid Particle Swarm-Pattern Search Optimizer for Aerospace Propulsion Applications," Journal of Spacecraft and Rockets, Volume 49, No. 3 (May-June 2012).

Dyer, John; Hartfield, Roy; and Dozier, Gerry, "Aerospace Design Optimization Using a Steady State Real-Coded Genetic Algorithm", Applied Mathematics and Computation, Volume 218, Issue 9, 1 January 2012, Pages 4710–4730.

Riddle, D., Hartfield, R., Burkhalter, J. E., and Jenkins, R. M., "Design of Liquid Rocket Powered Missile Systems Using a Genetic Algorithm," Journal of Spacecraft and Rockets, Vol. 46, No. 1, January-February 2009, pp. 151-159.

Bayley, D. J., Hartfield, R. J., Burkhalter, J. E., and Jenkins, R. M., "Design Optimization of Space Launch Vehicle Using a Genetic Algorithm," Journal of Spacecraft and Rockets, Vol. 45, No. 4, July-August 2008, pp. 733-740.

Hartfield, Roy J., Jenkins, Rhonald M., Burkhalter, John E., "Ramjet Powered Missile Design Using a Genetic Algorithm," Journal of Computing and Information Science In Engineering, Vol. 7, No. 2, June, 2007.

Hartfield, Roy J., Jenkins, Rhonald M., Burkhalter, John E., "Optimizing a Solid Rocket Motor Boosted Ramjet Powered Missile Using a Genetic Algorithm", Applied Mathematics and Computation, Vol. 181, No. 2, (2006) pp. 1720-1736

Hartfield, R.J., Burkhalter, J. E., and Jenkins, R. M., "Scramjet Missile Design Using Genetic Algorithms", Applied Mathematics and Computation, Vol. 174, No. 2, (2006), pp. 1539-1563.

Hartfield, Roy J. Jr., "Interpretation of Spectroscopic Data From the Iodine Molecule Using a Genetic Algorithm," Applied Mathematics and Computation, Vol. 177, (2006), pp 597-605.

Hartfield, Roy J., Jenkins, Rhonald M., Burkhalter, John E., and Foster Winfred, "Analytical Methods for Predicting Grain Regression in Tactical Solid-Rocket Motors," Journal of Spacecraft and Rockets, Vol. 41, No. 4, July-August 2004, pp.689-693.

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Szasz, G., Flowers, G., and Hartfield, R., "Hub Based Vibration Control of Multiple Rotating Airfoils," Journal of Propulsion and Power, Vol.16, No. 6, November 2000, pp. 1155-1163.

Hartfield, R. J., Rose, Steven K., and Abbitt, J. D., "Computational Fluid Imaging for Iodine Fluorescence in Compressible Flows," Applied Mathematics and Computation, Vol. 95, (1998) pp. 63-73.

Hartfield, R. J., and Bayley, D. J., "Experimental Investigation of Angled Injection in a Compressible Flow," Journal of Propulsion and Power, Vol. 12, No. 2, March 1996, pp. 442-445.

Eklund, D. R., Fletcher, D. G., Hartfield, R. J., Jr., Northam, G. B., and Dancey, C. L., "A Comparative Computational/Experimental Compressible Flow Field Investigation. Mach 2 Flow Over a Rearward-Facing Step," Computers in Fluids, Vol. 24, No. 5, pp. 593-608.

Burkhalter, J. E., Hartfield, R. J., and Leleux, T. M., "Non-Linear Aerodynamic Analysis of Grid Fin Configurations," Journal of Aircraft, Vol. 32, No. 3, May 1995, pp. 547-554.

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Normal Injection into a Mach 2 Flow Behind a Rearward-Facing Step," AIAA Journal, Vol. 32, No. 5, May 1994, pp. 907-916.

Hollo, S. D., McDaniel, J. C. and Hartfield, R. J., Jr., "Quantitative Investigation of Compressible Mixing: Staged Transverse Injection into Mach 2 Flow," AIAA Journal, Vol. 32, No. 3, March 1994, pp. 528-534.

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Hartfield, R. J., Hollo, S. D. and McDaniel, J. C., "A Unified Planar Measurement Technique for Compressible Flows Using Laser-Induced Iodine Fluorescence," AIAA 92-0141, Presented at the AIAA 30th Aerospace Sciences Meeting, Reno, NV January 1992.

McDaniel, J.C., Fletcher, D. G., Hartfield, R. J., Jr., and Hollo, S. D., "Staged Transverse Injection into Mach 2 Flow Behind a Rearward-Facing Step: A 3-D Compressible Test Case for Hypersonic Combustor Code Validation," AIAA 91-5071, Presented at the 3rd International Aerospace Plane Conference, Orlando, FL December 1991.

Hollo, S. D., McDaniel, J. C. and Hartfield, R. J., Jr., "Characterization of Supersonic Mixing In a Nonreacting Mach 2 Combustor," AIAA-92-0093, Presented at the AIAA 30th Aerospace Sciences Meeting, Reno, NV January 1992.

Hartfield, Roy, and Eskridge, Richard, "Experimental Investigation of a Simulated LOX Injector Flow Field," AIAA-93-2373, Presented at the AIAA/SAE/ASME/ASEE 29th Joint Propulsion Conference and Exhibit, Monterey, CA June 1993.

Stafford, Mark A., and Hartfield, Roy J., Jr., "Experimental Investigation of Slot Injection into Supersonic Flow with an Adverse Pressure Gradient," AIAA-93-2442, Presented at the AIAA/SAE/ASME/ASEE 29th Joint Propulsion Conference and Exhibit, Monterey, CA June 1993.

Belcher, Valerie M., Mackowski, Daniel W., Hartfield, Roy J., and Bhavnani, Sushil H., "Leak Detection Methods for Spacecraft-Based Crystal Growth Furnaces," AIAA-94-0335, Presented at the 32nd Aerospace Sciences Meeting and Exhibit, Reno, NV, January 1994.

Hartfield, R. J., Stafford, M., and Williams, S., "Mixing From a Slot Injector in Compressible Flow With an Adverse Pressure Gradient," AIAA 95-0521, Presented at the 33rd AIAA Aerospace Sciences Meeting, Reno, NV, January 1995.

Bayley, Douglas J., and Hartfield, R. J., "Experimental Investigation of Angled Injection in a Compressible Flow," AIAA 95-2414, Presented at the 31st AIAA/SAE/ASME/ASEE Joint Propulsion Conference and Exhibit, San Diego, CA July 1995.

Rose, Steven K., and Hartfield, Roy J., "Experimental and Analytical Investigation of Injection Behind a Pylon in a Compressible Flow," AIAA 96-0918, Presented at the 34th AIAA Aerospace Sciences Meeting, Reno, NV, January 1996.

Williams, Steve and Hartfield, Roy J., "An Analytical Investigation of Angled Injection Into a Compressible Flow," AIAA-96-3142, Presented at the 32nd AIAA/SAE/ASME/ASEE Joint Propulsion Conference and Exhibit, Lake Buena Vista, FL, July 1996.

Hartfield, Roy J., Dobson, C., Eskridge, R. and Wehrmeyer, J., "Development of a Technique for Separating Raman Scattering Signals from Background Emission With Single-Shot Measurement Potential," AIAA 97-3357, Presented at the 33rd AIAA/SAE/ASME/ASEE Joint Propulsion Conference and Exhibit, Seattle, WA, July 1997.

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White, P. S., Best, S. R., Hrbud, I., Hartfield, R. J., and Rose, M. F., "RF Plasma Thrusters for SMALLSAT Applications," AIAA-99-2438, Presented at the 35th AIAA/SAE/ASME/ASEE Joint Propulsion Conference and Exhibit, Los Angeles, CA, June 1999.

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Ahmed, Anwar, Wissler, John B., and Hartfield, Roy J., "Experiments on Laser Beam Propagation through Incompressible and Compressible Flow Regimes" AIAA Paper 2000-2352, Presented at the 31st AIAA Plasmadynamics and Lasers Conference, Denver, CO, June 19-22, 2000.

Hartfield, R., Burkhalter, J., Jenkins, R., Anderson, M., and Witt, J., "Analytical Development of a Slotted Grain Solid Rocket Motor," AIAA Paper 2002-4298, Presented at the 38th AIAA/ASME/SAE/ASEE Joint Propulsion Conference, Indianapolis, IN, July 7-10, 2002.

J.E. Burkhalter, R.M. Jenkins, and R.J. Hartfield, M. B. Anderson, G.A. Sanders, “Missile Systems Design Optimization Using Genetic Algorithms,” AIAA Paper 2002-5173, Classified Missile Systems Conference, Monterey, CA, November, 2002

Hartfield, R., “Interpretation of Spectroscopic Data From the Iodine Molecule Using a Genetic Algorithm,” AIAA Paper 2003-0404, Presented at the 41st AIAA Aerospace Sciences Meeting and Exhibit, Reno, NV, January 6-9, 2003.

Hartfield, Roy J., Jenkins, Rhonald M., Burkhalter, John E., and Foster Winfred, “A Review of Analytical Methods for Solid Rocket Motor Grain Analysis” AIAA 2003-4506, Presented at the 39th AIAA/ASME/SAE/ASEE Joint Propulsion Conference, Huntsville, AL, July 20-23, 2003.
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Hartfield, Roy J., Jenkins, Rhonald M., Burkhalter, John E., “Ramjet Powered Missile Design Using a Genetic Algorithm,” AIAA 2004-0451, Presented at the 42nd AIAA Aerospace Sciences Meeting, Reno NV, January 5-8, 2004.

Hartfield, Roy J., Jenkins, Rhonald M., Burkhalter, John E., "Genetic Algorithm Design Results for a Ramjet Powered Missile", AIAA-2004-6551, Presented at the AIAA 1st Intelligent Systems Technical Conference, Chicago, IL, September 2004.

Burkhalter, J. E., Jenkins, R.M., and Hartfield, R.J., "Scramjet Missile Design Using Genetic Algorithms", AIAA-2004-6551, Presented at the AIAA 1st Intelligent Systems Technical Conference, Chicago, IL, September 2004.

Foster, W.A., Hartfield, R. and Jenkins, R., "Propulsion Education at Auburn University", an invited paper presented at the 40th AIAA/ASME/SAE/ASEE Joint Propulsion Conference, Fort Lauderdale, FL, July 2004.

Hartfield, Roy J. and Burkhalter, John E., "Distributed Measurement of Aerodynamic Loads Using a Small Scale Wind Tunnel Model," AIAA -2005-1032, Presented at the 43rd Aerospace Sciences Meeting and Exhibit, January 9-13, 2005, Reno, Nevada.

Jenkins, Rhonald M., Hartfield, Roy J., and Burkhalter, John E., **"**Optimizing a Solid Rocket Motor Boosted Ramjet Powered Missile Using a Genetic Algorithm", AIAA 2005-3507, Presented at the 41st AIAA/ASME/SAE/ASEE Joint Propulsion Conference, Tucson, AZ, July 10-13, 2005.

Burger, Christoph and Hartfield, Roy J., "Propeller Performance Optimization using Vortex Lattice Theory and a Genetic Algorithm", AIAA-2006-1067, Presented at the Forty-Fourth Aerospace Sciences Meeting and Exhibit, Reno, NV, Jan 9-12, 2006.

Doyle, Josh B., Hartfield, Roy J. and Roy, Christopher J., "Tractor Trailer Drag Optimization by a Genetic Algorithm with CFD", AIAA 2006-3863, Presented at the 24th AIAA Applied Aerodynamics Conference, San Francisco, CA, June 5-8, 2006.

Burger, Christoph and Hartfield, Roy J., "Wind Turbine Airfoil Performance Optimization using the Vortex Lattice Method and a Genetic Algorithm", AIAA 2006-4051, Presented at the 4th AIAA Energy Conversion Engineering Conference, San Diego, CA, June 26-29, 2006.

Hartfield, R. J., "Incorporating Optimization in the Study of Rocket Propulsion AIAA 2006-4314, Presented at the 40th AIAA/ASME/SAE/ASEE Joint Propulsion Conference, Sacramento, CA, July 9-12, 2006.

Metts, J., Hartfield, R.., Burkhalter, J. and Jenkins, R., "Reverse Engineering of Solid Rocket Missiles with a Genetic Algorithm", AIAA Paper 2007-0363, Presented at the 45th Aerospace Sciences Meeting and Exhibit, Reno, NV, Jan 8-11, 2007.

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Burger, Christoph, Hartfield, Roy J. and Burkhalter, John E., "Performance and Noise Optimization of a Ducted Propeller using the Vortex Lattice Method and a Genetic Algorithm," AIAA Paper 2007-1883, Presented at the 3rd AIAA Multidisciplinary Design Optimization Specialist Conference, Honolulu, Hawaii, April 23-26, 2007.

Bayley, Douglas, Hartfield, Roy, J., Burkhalter, John. E., and Jenkins, Rhonald M., "Design Optimization of a Space Launch Vehicle Using a Genetic Algorithm," AIAA Paper 2007-1863, Presented at the 3rd AIAA Multidisciplinary Design Optimization Specialist Conference, Honolulu, Hawaii, April 23-26, 2007.

Burger, Christoph and Hartfield, Roy J., "Design, Testing and Optimization of a Constant Torque Propeller," AIAA paper 2007-3927, Presented at the 25th AIAA Applied Aerodynamics Conference, Miami, Florida, June 25-28, 2007.

Bayley, Douglas and Hartfield, Roy, J., "Design Optimization of Space Launch Vehicles for Minimum Cost Using Different Propulsion Types and a Genetic Algorithm," AIAA paper 2007-5852, Presented at the 43rd AIAA/ASME/SAE/ASEE Joint Propulsion Conference & Exhibit, Cincinnati, OH, July 8-11, 2007.

Doyle, J., Hartfield, R.J., and Roy, C. "Aerodynamic Optimization for Freight Trucks using a Genetic Algorithm and CFD", AIAA 2008-0323, Presented at the 46th Aerospace Sciences Meeting and Exhibit, Reno, NV, January 2008.

Hartfield, R. J., "Development of a Rotary Vane Gas Cycle Heat Engine", AIAA-2008-4703, Presented at the 44th AIAA/ASME/SAE/ASEE Joint Propulsion Conference & Exhibit, July 20-23, 2008, Hartford, CT.

McDavid, Brian, Hartfield, Roy, and Burkhalter, John, "Launch Vehicle Performance Enhancement Using Aerodynamic Lifting During Early Flight", AIAA 2008-6916, Presented at the 26th AIAA Applied Aerodynamics Conference, August 18-21, 2008, Honolulu, HI.

Dyer, John; Hartfield, Roy; Dozier, Gerry, and Burkhalter, John, "Aerospace Design Optimization Using a Steady State Real-Coded Genetic Algorithm", AIAA 2008-5921, Presented at the 12th AIAA Multidisciplinary Analysis and Optimization Conference, September 10-12, 2008, Victoria, BC.

Ahuja, Vivek and Hartfield, Roy, "Optimization of Fuel-Air Mixing for a Scramjet Combustor Geometry using CFD and a Genetic Algorithm", AIAA 2008-5925, Presented at the 12th AIAA Multidisciplinary Analysis and Optimization Conference, Victoria, BC, September 10-12, 2008.

Thomas, Scott, and Hartfield, Roy, "Methods for Optimization of a Launch Vehicle for Pressure Fluctuation Levels and Drag," AIAA-2009-1275, Presented at the 47th AIAA Aerospace Sciences Meeting and Exhibit, Orlando, FL, January 5-8, 2009.

Foster, W. A., Jr., Hartfield, R. H. and Thurow, B. "Propulsion Research Activities Abound at Auburn University", Chemical Propulsion Information Analysis Center Bulletin, The Johns Hopkins University, Columbia, Maryland, May 2009.

Hall, Zachary, Ahuja, Vivek, Hartfield, Roy, and Ahmed, Anwar, "Optimization of a Turbofan Inlet Duct Using Genetic Algorithms and CFD", AIAA-2009-3775, presented at the 27th AIAA Applied Aerodynamics Conference, San Antonio, TX, June 25-29 2009.

Ahuja, Vivek and Hartfield, Roy, "Optimization of Fuel-Air mixing for a Swept Ramp Scramjet Combustor Geometry using CFD and a Genetic Algorithm," AIAA-2009-5195, Presented at the 45th AIAA/ASME/SAE/ASEE Joint Propulsion Conference & Exhibit, 2009, Denver, CO, August 2-5, 2009.

Ahuja, Vivek and Hartfield, Roy, "Optimization of Air-breathing Hypersonic Aircraft Design for Maximum Cruise Speeds using Genetic Algorithms", AIAA-2009-7323, Presented at the 16th AIAA/DLR/DGLR International Space Planes and Hypersonic Systems and Technologies Conference, Bremen Germany, October 19-22, 2009.

Ahuja, Vivek and Hartfield, Roy, "Preliminary Design Drag Calculation Using Advanced Paneling Schemes", AIAA 2010-0063, Presented at the 48th AIAA Aerospace Sciences Meeting, Orlando, Florida, January 4-7, 2010.

Badyrka, Jeffrey and Hartfield, Roy, "Aerospace Design: A Comparative Study of Optimizers", AIAA 2010-1311, Presented at the 48th AIAA Aerospace Sciences Meeting, Orlando, Florida, January 4-7, 2010.

Ahuja, Vivek and Hartfield, Roy, "Optimization of UAV Designs for Aerodynamic Performance Using Genetic Algorithms," AIAA 2010-2759, Presented at the 6th AIAA Multidisciplinary Design Optimization Specialist Conference, Orlando, Florida, April 12-15, 2010.

Ahuja, Vivek and Hartfield, Roy, "Optimization of Airbreathing Hypersonic Aircraft Design Using Euler Codes and Genetic Algorithms," AIAA 2010-6789, Presented at the 46th AIAA/ASME/SAE/ASEE Joint Propulsion Conference and Exhibit, Nashville, TN, July 25-28, 2010.

Jenkins, Rhonald, and Hartfield, Roy, "Hybrid Particle Swarm-Pattern Search Optimizer for Aerospace Propulsion Applications," AIAA 2010-7078, Presented at the 46th AIAA/ASME/SAE/ASEE Joint Propulsion Conference and Exhibit, Nashville, TN, July 25-28, 2010.

Albarado, Kevin, Hartfield, Roy and Burkhalter, John, "Optimization of an Aero-Assisted Launch Vehicle," AIAA 2010-9089, Presented at the 13th AIAA/ISSMO Multidisciplinary Analysis and Optimization Conference, Ft. Worth Texas, September 13-15, 2010.

Albarado, Kevin, Ahuja, Vivek, and Hartfield, Roy, "Trajectory Control Dynamics For Path Following Vehicles," presented at the 34th Annual AAS Guidance & Control Conference, Feb 4–9, 2011, Breckenridge, Colorado

Carpenter, D. M., Hartfield, R. J., and Burkhalter, J. E., "A Comprehensive Approach to Cataloging Missile Aerodynamic Performance Using Surrogate Modeling Techniques and Statistical Learning," AIAA 2011-3029, Presented at the 29th AIAA Applied Aerodynamics Conference, Honolulu, HI, June 27-30 2011.

Ahuja, Vivek and Hartfield, Roy, "Aero-Propulsive Optimization of the Boeing-737 Wing-Engine Integrated Geometry using Smart Panel Approaches and Modified Potential Theory," AIAA 2011-3805, presented at the 29th AIAA Applied Aerodynamics Conference, Honolulu, HI, June 27-30 2011.

Ahuja, Vivek and Hartfield, Roy, "Genetic Algorithm Results for the Boeing-737 Wing-Engine Geometry," accepted for presentation at the 47th AIAA/ASME/SAE/ASEE Joint Propulsion Conference and Exhibit, San Diego, CA, July 31-Aug. 3, 2011.

Hartfield, Roy, and Ahuja, Vivek, "The Closing Boundary Condition for the Axis-Symmetric Method of Characteristics" AIAA 2011-5943, presented at the 47th AIAA/ASME/SAE/ASEE Joint Propulsion Conference and Exhibit, San Diego, CA, July 31-Aug. 3, 2011.

Albarado, Kevin, Hartfield, Roy, Hurston, Benjamin, and Jenkins, Rhonald, "Solid Rocket Motor Performance Matching Using Pattern Search/Particle Swarm Optimization," AIAA 2011-5798 presented at the 47th AIAA/ASME/SAE/ASEE Joint Propulsion Conference and Exhibit, San Diego, CA, July 31-Aug. 3, 2011.

Beckey, Carl, Hartfield, R., and Carpenter, D., "Compressor Modeling for Engine Control and Maintenance," AIAA 2011-6101, presented at the 47th AIAA/ASME/SAE/ASEE Joint Propulsion Conference and Exhibit, San Diego, CA, July 31-Aug. 3, 2011.

Hartfield, R., Ahuja, V., Albarado, K., and Walsh, T., "A Method for Optimizing Launch Vehicle Aero-Assist Including Path Optimization," AIAA 2011-6566, Presented at the AIAA Atmospheric Flight Mechanics Conference , Portland, Oregon, Aug 8–11, 2011.

Ahuja, V., and Hartfield, R., "Application of Distributed Singularities Concept to Arbitrary Aerodynamic Bodies," AIAA 2012-1072, Presented at the AIAA 50th Aerospace Sciences Meeting, Nashville, Tennessee, Jan. 9-12, 2012.

Albarado, Kevin, Hartfield, R., Carpenter, D., Burkhalter, J. and Ritz, S., "Rapid Missile Classification for Early Launch Using Neural Networks," MDC-FD-1257201-12, Presented at the AIAA 10th annual U. S. Missile Defense Conference and Exhibit, Washington, DC, March 26-28, 2012.

Hartfield, R., Jenkins, R., and Albarado, K., "Evolving Swarm-A Genetically Modified Particle Swarm Optimizer with Localized Pattern Search Capability for Aerospace Propulsion Systems," AIAA-2012-4214, Presented at the 48th AIAA/ASME/SAE/ASEE Joint Propulsion Conference & Exhibit, Atlanta, GA, July 29- August 1, 2012.

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"FINAL REPORT: Phase I Aerodynamic Drag Study for the MC-130E Talon I," Hartfield, Roy, and Burkhalter, John E., submitted to Support Systems Associates, Inc., Warner Robbins, GA, May 11, 2004 Contract No. F09603-02-D-0065 Subcontract No. Auburn-0065-02-02.

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Crocker, Malcolm J., and Hartfield, Roy J., "Water Injection for Reduction of Launch Noise and Suppression of Ignition Overpressure Generated by Launch Vehicles," Final Report submitted to United Launch Alliance, December 2008.

Hartfield, Roy, Burkhalter, John, Jenkins, Rhonald, Badyrka, Jeffrey, Hurston, Benjamin, Johnson, Casey and Druckemiller, Justin, "Genetic Algorithm Guidance & Control Goal Definitions Upgrade" submitted to Department of Defense, Redstone Arsenal, Alabama 35898, March, 2009.

Hartfield, Roy J., and Crocker, Malcolm, J., "Assessment of Launch Vehicle Ascent Pressure Fluctuation Levels," Final Report for NASA NESC, 2010.

Hartfield, Roy J., and Ahmed, Anwar, "Dynamic (power-on) Propeller Efficiency and Acoustic Study," Submitted to US Army, AMRDEC, Redstone Arsenal, AL, January 2010.

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Hartfield, R. J., Cochran, J.E., and Crouse, G., "Evaluation of Future Rotary Wing Vehicle Concepts Using Optimization Based Trade Studies", submitted to US Army, AMRDEC, Redstone Arsenal, AL, June 2010.

Hartfield, Roy J., Burkhalter, John E., Jenkins, Rhonald M., Carpenter, David M., Albarado, K., Badyrka, J., and Ritz, S., "Optimization Techniques For Advanced Missile Analysis", submitted to Department of Defense, Redstone Arsenal, Alabama 35898, April 2011.

Randall, Wesley S., Hartfield, Roy J., and Carpenter, David M., "Unmanned Air Vehicles (UAV): Safety Event Prediction, Classification, and Policy Implication" submitted to the Federal Aviation Administration, September 2011.

Hartfield, Roy J., Burkhalter, John E., Jenkins, Rhonald M., Carpenter, David M., Albarado, K., Badyrka, J., Ritz, S., Ledlow, Timothy W., and Walsh, Thomas, "Missile Design Optimization Methods", submitted to Department of Defense, Redstone Arsenal, Alabama 35898, March 2012.

Hartfield, Roy J., Burkhalter, John E., Kiyak, Z., Ledlow, Timothy W., and Ritz, S., "Missile Design Optimization Methods", submitted to Department of Defense, Redstone Arsenal, Alabama 35898, May 2013.

"Modular Generalized Framework for Assessing Aircraft Aero-Propulsive, Stability, and Control Characteristics," Chakraborty, I., and Hartfield, R., NASA Transformational Tools and Technology Contract, Year 1 Final Report, December 15, 2019.

"Emerging Threat Analysis," Hartfield, R., and Carpenter M., DoD Redstone Arsenal, Alabama 35898, via Dynetics, Final Report, February 29, 2020.

"Solid-Propellant Motor Analysis Tool," Hartfield, R., and Carpenter M., DoD Redstone Arsenal, Alabama 35898, via Parsons, Final Report, August 25, 2020.

RESEARCH EXPERIENCE

My primary research interest in graduate school was non-intrusive flow diagnostics primarily for high speed compressible flows. I continued to work in that area for several years and developed some innovative techniques using Raman Scattering at NASA MSFC. For reasons of professional interest, I began to pursue avenues of research involving design. Gradually, I moved from experimental flow diagnostics to more conventional wind tunnel testing, modeling of aerodynamic and propulsion systems and finally to optimizing such systems. This change in focus for my research has been very successful and I have now established a strong research program in the area of design optimization for aerospace systems using Genetic Algorithms and other optimizers. This work includes modeling and optimizing complete missile systems, aerodynamic shapes, propellers, wind turbines and other devices.

In the area of rocket design, I have a continuing program funded periodically by the Department of Defense (DoD) to develop the tools necessary for design and reverse engineering of missiles. I have completed two efforts with Dr. Malcolm Crocker to predict the pressure fluctuation levels on new launch vehicles. One of these efforts was funded by NASA and the other was funded by the United Launch Alliance. More current work involves statistical analysis development methods development in collaboration with Dr. Mark Carpenter of COSAM. Surrogate models and classification are the leading areas of the statistical analysis research. Our most recent effort involves the use of a surface vorticity solver to extract the internal ballistics of a solid rocket motor.

Work in the recent past includes risk assessment for unmanned aerial vehicles (FAA), scramjet powered vehicle optimization (DoD), surrogate modeling (DoD), launch vehicle design optimization (NASA), and early identification of missile threats (DoD). I am also currently writing a text entitled Applied Rocket Propulsion under contract with John Wiley.

In the area of aircraft research, work over the past seven years in collaboration with my former PhD student has led to the development of a world leading aerodynamic analysis tool known as FlightStream®. This activity has mostly involved the consulting activities funded through SBIR's and STTR's; however, in recent years this effort has paid dividends in the form of Auburn University Research Contracts.

SELECTED RESEARCH CONTRACTS

"Development of Nonintrusive, Scatter-Independent Techniques for Measurement of Liquid Density Inside Dense Sprays," Hartfield, R., funded by NASA MSFC, December 1993 to December 1994, $20,000.

"Hydrocarbon-Fueled Rocket Plume Measurement Theoretical Development," Hartfield, R., funded by NASA MSFC through Vanderbilt University from May 1, 1998 - December 31, 2000, $15,000.

“Nonlinear Dynamics and Control Issues for Bladed Disk Vibration Suppression Using Magnetic Bearings," National Science Foundation, $176,414 plus COE cost sharing, 3 years (1996-2000), George Flowers, P.I., Subhash Sinha, Co-P.I. and Roy Hartfield, Co-P.I.

"Suppression of Flow Induced Vibrations Using Active Control of Blade Tip Clearance," Ahmed, A., Flowers, G. and Hartfield, R., Auburn University Infrastructure Award for fiscal 2000 and fiscal 2001, $99,320.

"Suppression of Flow Induced Vibrations Using Active Control of Blade Tip Clearance," Flowers, G., Hartfield, R., and Ahmed, A., Auburn University Graduate Student Research Assistantship program for fiscal 2000 and fiscal 2001, $20,000.

“Genetic Algorithms for Missile Analysis,” Department of Defense, Redstone Arsenal, AL, $99,951, May 16, 2002 – Feb 15, 2003, J.E. Burkhalter, R.M. Jenkins, and R.J. Hartfield.

“Missile Design Synthesis, Genetic Algorithm Method,” U. S. Army Aviation and Missile Command, Redstone Arsenal, AL $74,750, May 16, 2002 – Dec 31, 2002, J.E. Burkhalter, R.M. Jenkins, R.J. Hartfield.

“MC-130H Model Construction and Wind Tunnel Tests”, Burkhalter, John E. and Hartfield, Roy J., funded by Support Systems Associates, Inc., Melbourne, FL, $57,717, May 2003-September 2003.

“Model Development and Wind Tunnel Test for the MC-130E Aircraft- Phase I”, Hartfield, Roy J. and Burkhalter, John E., funded by Support Systems Associates, Inc., Melbourne, FL, $49,581, March 2004-May 2004.

“Model Development and Wind Tunnel Test for the MC-130E Aircraft- Phase II”, Hartfield, Roy J. and Burkhalter, John E., funded by Support Systems Associates, Inc., Melbourne, FL, $69,777, May 2004-December 2004.

“Genetic Algorithm Upgrade”, Hartfield, R. J., Burkhalter, J. E. and Jenkins, R. M., funded by the Department of Defense, Redstone Arsenal, AL, $49,950, June 16, 2004-June 15, 2005.

“Aerodynamic Drag Reduction and Safety Analysis for Tractor/Trailers”, Roy, C. J., Ahmed, A. and Hartfield, R. J., Department of Transportation, federal Motor carrier Safety Administration, in conjunction with Digital Fusion of Huntsville, AL, September 2005- September 2006, $248,000, 1 year.

“Genetic Algorithm Developments for Liquid Missile Analysis”, Roy Hartfield, PI, DoD, September 16, 2005 to September 15, 2006, $149,950.

“Genetic Algorithm Support,” Roy Hartfield, PI, DoD, May 15, 2006 to August 7, 2006, $24,584.

"HOT-D RAMJET Development," Roy Hartfield, PI, System Simulation and Development Directorate US Army AMRDEC, April 19, 2006 to December 31, 2006, $100,000.

"Genetic Algorithm Developments for Multiple Stage, Non-Constant Diameter Missiles," Roy Hartfield, PI, DoD, January 22, 2007 to January 21 2008, $100,000.

"Launch Vehicle Ascent Aeroacoustics," Roy Hartfield, PI, Malcolm Crocker PI, NASA Marshall Space Flight Center, November 2007 to October 2010, $249,000.

"Genetic Algorithm Guidance & Control Goal Definitions Upgrade," Roy Hartfield, PI, DoD, March, 2008 to March 2009, $150,000.

"Water Injection for Reduction of Launch Noise", Malcolm Crocker, PI and Roy Hartfield, PI, United Launch Alliance, October 1, 2008-December 15, 2008, $60,000.

"Genetic Algorithm Development for Multi-Optimal Solution Characterization & Trajectory Matching," Roy Hartfield, PI, MSIC, March, 2009 to March 2010, $150,000.

"Dynamic (power-on) Propeller Efficiency and Acoustic Study," Roy Hartfield, PI, and Anwar Ahmed, Co-PI, AMRDEC, Redstone Arsenal, September 29, 2009 to December 15, 2009, $25,000.

"Evaluation of Future Rotary Wing Vehicle Concepts Using Optimization Based Trade Studies", Roy Hartfield, PI, John Cochran, Co-PI, and Gilbert Crouse, Co-PI, AMRDEC, Redstone Arsenal, September 29, 2009 to December 15, 2009, $149,000.

"Optimization Techniques For Advanced Missile Analysis," Roy Hartfield, PI, DoD, Redstone Arsenal, March 2010 to March 2011, $175,000.

"Development of Probability Models for UAS Performance," Wesley Randall, Roy Hartfield, David (Mark) Carpenter, FAA, August 16, 2010 – August 15, 2011, FAA, $300,000.

"Missile Design Optimization Methods", Roy Hartfield, DoD Redstone Arsenal, Alabama 35898, March 2011-March 2012, $150,000.

"Missile Design Optimization Methods II", Roy Hartfield, DoD Redstone Arsenal, Alabama 35898, May 23, 2012-May 22, 2013, $75,000.

"Auburn University Student Space Program, Alabama Space Grant Projects for Workforce Development," David Beale, J-M Wersinger, and Roy Hartfield, University of Alabama in Huntsville (Alabama Space Grant Consortium) with a match from Auburn University, May 1, 2012 – April 30, 2013, $205,744 total.

"Missile Design Optimization Methods II", Roy Hartfield, DoD Redstone Arsenal, Alabama 35898, May 23, 2013-May 22, 2014, $100,000.

"Subcooled Propane as a fuel for Launch Vehicles," Hartfield, R., NASA MSFC, July 16, 2013-July 15, 2015, $100,000 funded at $50,000 per year.

"Modular Generalized Framework for Assessing Aircraft Aero-Propulsive, Stability, and Control Characteristics," Chakraborty, I., and Hartfield, R., NASA Transformational Tools and Technology Contract, December 15, 2018 – December 14, 2021, via Research in Flight, $280,000.

"Energy-Based Aero-Propulsive Approach to Flight Vehicle Sizing", Hartfield, R., and Chakraborty, I, Auburn University 2018-2019 Intramural Grants Program, $20,000.

"Emerging Threat Analysis," Hartfield, R., and Carpenter M., DoD Redstone Arsenal, Alabama 35898, via Dynetics, March 1, 2019-February 29, 2020, $180,000.

"Solid-Propellant Motor Analysis Tool," Hartfield, R., and Carpenter M., DoD Redstone Arsenal, Alabama 35898, via Parsons, August 26, 2019-August 25, 2020, $170,000.

"Quantification of Confidence Level of Missile Models," Hartfield, R., Yilmaz, L., and Carpenter M., DoD Redstone Arsenal, Alabama 35898, via Parsons, August 14, 2020-August 15, 2021, $386,100.

"Early-Design Aeroacoustics Prediction for Distributed Electric Propulsion Vehicles using FlightStream," Majdalani, J., and Hartfield, R., NASA STTR via Research in Flight, September 1, 2020 – September 30, 2021, $37,500.

UNIVERSITY SERVICE (Selected Items)

Assistant Department Chair, Aerospace Engineering, 2017 – present.
Member of the Auburn University Council on Energy and Environment Research, 2012-2015
Member, University Writing Committee, 2011-2012
Member, University Tenure and Promotion Committee, 2007- 2010
Member, University Faculty Welfare Committee, 2007 – 2010
Chair, University Faculty Welfare Committee, 2008
Member, University Campus Planning Committee, 1994-1996
AE representative on the College of Engineering Initiatives Committee 1993-1997
AE Graduate Program Officer, 1997-2004
AE Departmental E-Day coordinator, 1992-2002
Outside Reader for numerous dissertations

CONSULTING AND PROFESSIONAL ACTIVITIES

Member: Applied Aerodynamics (APA) Technical Committee, AIAA, 2004-2008
Secretary: Applied Aerodynamics (APA) Technical Committee, AIAA, 2005-2006
Chair of the Aerodynamic Design Subcommittee: APA TC, AIAA, 2005-2007
Technical Chair of the Applied Aerodynamics Conference, San Francisco, CA, June 2006
Member: AIAA High Speed Airbreathing Propulsion Technical Committee, 2008-present.
"Propulsion Short Course," presented to the Department of Defense, June 11-12, 2001 in collaboration with Dr. Rhonald Jenkins.
"Solid Rocket Motor Component Design," a short course presented to the Department of Defense, May, 2002 in collaboration with Dr. Rhonald Jenkins.
"Advanced Topics in Solid Rocket Motor Design," A short course presented to the Department of Defense, July, 2003 in collaboration with Dr. Rhonald Jenkins.
"Liquid Rocket Propulsion," A short course presented to analyst at the Central Intelligence Agency, August 6-10, 2007 in collaboration with Dr. Rhonald Jenkins.
A short course for the University of Kansas in conjunction with Dr. Rhon Jenkins entitled: "Solid Rocket Motor Propulsion", October 30-November 1, 2007, Orlando, FL.
A short course presented at NASA MSFC in conjunction with Dr. Rhon Jenkins and Dr. Winfred Foster entitled: "Solid Rocket Motor Propulsion", July 20-24, 2009, and again on Feb. 8-12, 2010, Huntsville, AL.

A short course presented at NASA MSFC in conjunction with Dr. Rhon Jenkins and Dr. Winfred Foster entitled: "Combustion Devices", July 19-23, 2010, Huntsville, AL.

Invited Lecture given at the South Korean Agency for Defense Development in Daejon, Korea, as a part of the "Foreign Professionalist Visiting Program" (FPVP), July 9-11, 2012. Topic: Scramjet Propulsion.

Invited Lecture entitled, "Advanced Methods for Optimization of Aerospace Systems," given at the Korean Aerospace University, Seoul, Korea, July 11, 2012.

Two Part Invited Lecture entitled, "FlightStream 2018," given in two parts, COMAC Aircraft, Shanghai, China and Chengdu Aircraft Design Institute, Chengdu, China

Hartfield Technology Company, Development of a Rotary Vane Engine.

NASA MSFC Summer Faculty Program, 1992, 1993, 1995, 1996

Reviewer for McGraw Hill dynamics texts

Reviewer for AIAA Journal

Reviewer for Journal of Propulsion and Power

Reviewer for Journal of Heat Transfer

Reviewer for Experiments in Fluids

Applicant Reviewer for the National Defense Science and Engineering (NDSE) Graduate Fellowship Program, 1994, 1996, 1998.

In the area of consulting via Research in Flight to sometimes include Auburn contracts, I have been the CoPI or CoI along with Burkhalter, Ahuja, Chakraborty, Majdalani, and Foster on the following: 2015 SBIR Phase I, 2016 SBIR Phase I, 2017 SBIR Phase II, 2018 NASA TTT Program, 2019 STTR Phase I, 2020 STTR Phase I, NIA 2014, NIA 2015.

TECHNOLOGY DEVELOPMENT

CoFounder of Research in Flight. Research in Flight is the developer of FlightStream®, currently a world leader in aircraft aerodynamic analysis for conceptual and preliminary design. www.researchinflight.com.

US Patent No. 8,037,863, Positive Displacement Rotary Vane Engine, Issued October 18, 2011, Roy J. Hartfield, Jr., Inventor.

Chinese Patent No.: ZL 2008 8 0014298.4, Positive Displacement Rotary Vane Engine, Issued March 27, 2013, Roy J. Hartfield, Jr., Inventor.

US Patent 8,567,178 B2, "Positive Displacement Rotary Vane Engine," October 29, 2013, Roy J. Hartfield, Jr., Inventor.

Burger, Christoph, and Hartfield, Roy, US Patent 8,790,081 "Constant Torque Propeller Mechanism," Issued July 30, 2014.

During the spring of 2008, Kondor Model Products of Thunder Bay, Ontario licensed a propeller drive technology developed by Christoph Burger and Roy Hartfield for use in light sport aircraft and UAV's. The licensing agreement was transferred to Aerovate and a patent for the device was applied for.

COURSES TAUGHT

Quarter System

EGR 205 Undergraduate Statics

EGR 210 Mechanics for Electrical Engineers

AE 226 Undergraduate Aerospace Dynamics

AE 302 Undergraduate aerodynamics
AE 310 Undergraduate Aerospace Analysis
AE 326 Undergraduate Aerospace Dynamics
AE 415 Undergraduate Jet Propulsion
AE 517 Undergraduate/Graduate Solid Rocket Propulsion
AE 612 Graduate Aerothermochemistry (With Video Outreach Option)

Semester System

AERO 7970/7976/4970, Special Topics: Statistical Modeling and Analysis in Engineering, with Dr. Mark Carpenter of MAT
AERO 7510/7516 Thrust Generation (With Video Outreach Option)
AERO 7510/7516 Advanced Airbreathing Propulsion (With Video Outreach Option)
AERO 7530/7536 Aerothermochemistry (With Video Outreach Option)
AERO 6110/6116 Missile Aerodynamics (With Video Outreach Option)
AERO 5520/6520/6526 Rocket Propulsion (With Video Outreach Option)
AERO 5530/6530/6536 Space Propulsion (With Video Outreach Option)
AERO 4970 Launch Vehicle Design I
AERO 4970 Launch Vehicle Design II
AERO 4710 Aircraft Design
AERO 4510 Jet Propulsion
AERO 4140 Aerodynamics III
AERO 3120 Aerodynamics II
AERO 3110 Aerodynamics I
ENGR 2350 Engineering Dynamics

Continuing Education Courses (these are available through Engineering Continuing Education at AU)

- Fundamentals of Rocket Propulsion- https://aucatalog.hosted.panopto.com/Panopto/Pages/Viewer.aspx?id=e0bf6950-21ec-48dc-aae6-ac8b01234d0a
- Solid Propellant Rocket Propulsion- https://aucatalog.hosted.panopto.com/Panopto/Pages/Viewer.aspx?id=a6a99ad6-5c47-41cc-8434-ad8000f29eb4
- Liquid Propellant Rocket Propulsion- https://aucatalog.hosted.panopto.com/Panopto/Pages/Viewer.aspx?id=49c00e22-33d7-4de8-971f-aebc00f28919