Charles F. Reinholtz

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Embry-Riddle Aeronautical University
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Education

Doctor of Philosophy, University of Florida, Mechanical Engineering, 1983
Master of Engineering, University of Florida, 1980
Bachelor of Science, University of Florida, 1976

Full-time Industrial Experience

1978, Burroughs Corporation, Orlando, Florida, Design Engineer, Non-impact Printing Group
1989-1996 Milliken and Company, Spartanburg, South Carolina, summer employment and consulting involving textile equipment design

Academic Employment Experience

Virginia Polytechnic Institute and State University, Blacksburg, Virginia
Assistant Professor, September 1983 to August 1988, Tenure Granted
Associate Professor, August 1988 to August 1993
Professor, August 1993 to 2007
W. S. White Chair for Innovation in Engineering Education, Aug. 1996 to Aug. 1999
Assistant Department Head and ABET Review Chair, 1996-2002
Alumni Distinguished Professor, 2002-2007

Embry-Riddle Aeronautical University, Daytona Beach, Florida
Professor and Chair, Department of Mechanical Engineering, 2007-2017
Professor, Department of Mechanical Engineering, 2017-2022
Emeritus Professor and Chair, 2022-

Membership in Professional Organizations and Honor Societies

Society	Membership Grade
ASME	Fellow
SAE	Member
American Nuclear Society	Member 1995-1997
Tau Beta Pi	Member
Pi Tau Sigma	Member
Sigma Xi	Member
Epsilon Lambda Chi	Member
ASEE	Member, 1984-1987, 1998-99
AUVSI	Member

Professional Honors and Awards

Benton Engineering Council Service Key, University of Florida, 1976-1977.
Procter and Gamble Best Paper Award, 9th Applied Mechanisms Conference, October 1985.
Presidential Young Investigator Award, 1987-1992, National Science Foundation
Certificate of Teaching Excellence, Virginia Polytechnic Institute and State University, 1987-88, 1997-98 and 2001-02.

ASME Outstanding Faculty Advisor Award, 1989-1990 and 1991-92
Procter and Gamble Best Paper Award of Merit, 2nd National Applied Mechanisms and Robotics Conference, November 1991.
George Wood Best Applied Mechanism Design Paper Award, 2nd National Applied Mechanisms and Robotics Conference, November 1991.
Wine Award for Excellence in Teaching, Virginia Polytechnic Institute and State University, 1992.
Virginia Tech Academy of Teaching Excellence, Inducted 1992
Procter and Gamble Best Paper Award of Merit, 22nd ASME Mechanisms Conference, Scottsdale, Arizona, September 1992
ASME National Faculty Advisor Award, 1995.
Applied Mechanism Conference "Beyond the Call of Duty" Award for prodigious contributions to mechanism science, 1995.
W. S. White Chair for Innovation in Engineering Education, Aug. 1996 to Aug. 1998
Dean's Award for Excellence in Teaching, Virginia Tech College of Engineering, 1998
South-Pointing Chariot Award, 1999 Applied Mechanisms and Robotics Conference, for lifetime contributions to the mechanism's community
Ingersoll-Rand Faculty Award for Outstanding Contributions to the Mechanical Engineering Department, 2000
National Instruments Award for Best Application of Measurement and Automation for the Development of a Tele-Operated CASE CX-160 Excavator Using FieldPoint, National Instruments Week 2002, Austin Texas, Aug 12-15, 2002.
Virginia Tech Alumni Distinguished Professor, 2002-
Outstanding Faculty Member Award selected and awarded by the students in Mechanical Engineering, April 2003.
Fellow, American Society of Mechanical Engineers, 2003
Alumni Teaching Award, Virginia Polytechnic Institute and State University, 2004
National Instruments Virtual Instrumentation Applications Best Control Paper Award, Developing a Fully Autonomous Vehicle for Virginia Tech's Entry in the DARPA Grand Challenge," National Instruments NI Week 2006, Austin Texas.

ASME Distinguished Service Award, 2005
College of Engineering Certificate of Teaching Excellence, 2006-2007
Volusia Manufacture's Association "Friend of Industry" Award, 2013

Funded Research

1. "Design Optimization of Spatial Mechanisms Subject to Real-World Constraints," National Science Foundation Grant MEA-8404313, June 15, 1984 through November 30, 1986, $47,979, 100% Responsibility.

2. "Presidential Young Investigator Award: Interactive Spatial Mechanism Synthesis," National Science Foundation, Grant No. DMC 8657828, June 15, 1987 through January 31, 1993, $312,000, 100% Responsibility.

3. "High-Speed Bearing Research," supported by the Industrial Drives Division of Inland Motor Corporation, Jan. 1, 1987 through Dec. 31, 1987, $15,000, 100% Responsibility.

4. "Analysis of Warhead Structures," Department of the Navy, July 24, 1987 to November 15, 1987, $99,348, Project Director with J. B. Kosmatka, R. H. Fries, A. L. Wicks, and L. D. Mitchell, Responsible for $19,535.

5. "Analysis of Warhead Structures, Year 2," Department of the Navy, October 30, 1987 to March 31, 1988, $174,000, Project Director with J. B. Kosmatka, R. H. Fries, A. L. Wicks, and L. D. Mitchell, Responsible for $12,908.

6. "Hull Joint Model Test," Georgia Institute of Technology, May 16, 1988 to Aug. 16, 1988, $10,141, Principal Investigator with R. H. Fries, Responsible for $5,071.

7. "Design of Variable-Geometry Truss Manipulators," Virginia Center for Innovative Technology (CIT), 10/1/88 to 9/31/89, $30,000, 100% Responsibility.

8. "Active Structures for Space Applications," 1/1/89 to 12/31/90, $200,000, Principal Investigator with H. H. Robertshaw, Responsible for $80,000.

9. "Computer-Aided Design of Fully-Wiped, Co-rotating Extruder Screws," Windward International and CIT, January 1, 1989 through December 31, 1989, $44,029, Principal Investigator with Sanjay Dhande, Responsible for $22,015.

10. "Construction of a NASP Mock-up," NASA Langley Research Center, February 1, 1989 to July 15, 1989, $51,692, Principal Investigator with W. F. O'Brien, A. L. Wicks, and J. Marchman.

11. "Design of Advanced Manipulators for Steam Generator Maintenance," Babcock & Wilcox Co., November 1, 1989 to August 15, 1990, $20,000, Principal Investigator with Sanjay Dhande, Responsible for $15,000.

12. "Calibration, Control and Menu Design for an Advanced Steam-Generator Maintenance Manipulator," Babcock and Wilcox Co., February 1, 1991 through January 31, 1992, $41,408, Principal Investigator with Sanjay Dhande, Responsible for $31,056.

13. "Calibration, Control and Menu Design for an Advanced Steam-Generator Maintenance Manipulator," Virginia Center for Innovative Technology, February 1, 1991 through January 31, 1992, $29,663, Principal Investigator with Sanjay Dhande, Responsible for $22,247.

14. "Computer-Aided Design and Manufacture of Extruder Screw Elements," Windward International and CIT, July 1, 1990 through June 30, 1991, $30,984, Principal Investigator with Sanjay Dhande, Responsible for $15,492.

15. "Design of a Cellulose Acetate Preconditioning Heat Exchanger," Tennessee Eastman Co., October 1990 through July 1991, $25,560, Principal Investigator with D. J. Nelson, Responsible for $9,876.

16. "Continued Steam Generator Manipulator Support Based on Kinematic Control and Investigation of Vision Based Approach," Babcock and Wilcox Co., October 1, 1991 through September 31, 1992, $40,000, Principal Investigator with A. L. Abbott, Responsible for $32,000.

17. "Cellulose Acetate Packaging Study," Tennessee Eastman Co., October 1991 through July 1992, $51,120, Principal Investigator with D. J. Nelson, Responsible for $19,752.

18. "Continued Steam Generator Manipulator Support Based on Kinematic Control and Investigation of Vision Based Approach," Virginia CIT, January 1, 1992 through December 31, 1992, $35,570, Principal Investigator with A. L. Abbott, Responsible for $28,456.

19. "Preliminary Design of a Medical Waste Processing Machine," Virginia Center for Innovative Technology, June 1, 1992 through August 31, 1992, $14,386, 100% Responsibility.

20. "Preliminary Design of a Medical Waste Processing Machine," Bioconversions Technologies, May 1, 1992 through January 31, 1993, $16,377, 100% Responsibility.

21. "Conceptual Design of an Advanced Reactor Vessel Inspection Manipulator," B&W Nuclear Services Company, March 1, 1992 through February 28, 1993, $30,000, 100% Responsibility.

22. "Engineering Development of a Medical Waste Processing Machine," Bioconversions Technologies, Aug. 15, 1992 to May 15, 1994, Principal Investigator with A. A. Kornhauser, $93,088, responsible for $46,544.

23. "Engineering Development of a Medical Waste Processing Machine," CIT, Aug. 15, 1992 to Aug. 14, 1993, Principal Investigator with A. A. Kornhauser, $90,988, responsible for $45,494.

24. "Enhancing the Capability and Performance of Nuclear Service Robots with Kinematic Analysis and Computer Vision," B&W Nuclear Services Co., Dec.1, 1992 to Nov. 30, 1993, with A. L. Abbott, $50,000, responsible for $40,000.

25. "Design of a Reactor Vessel Inspection Manipulator," B&W Nuclear Services, June 16, 1992 through June 15, 1993, $100,146, 100% responsibility.

26. "Design of an Automated Needle/Armature Tray Loader," Siemens Automotive, Sept. 1, 1993 to Aug. 31, 1994, $24,925, 100% Responsibility.

27. "Enhancing the Design and Performance of Nuclear Service Robots with Flexure Analysis, Computer Vision, and Optimization Techniques," B&W Nuclear Technologies, Dec.1, 1993 to Nov. 30, 1994, with A. L. Abbott, $40,000, responsible for $30,000.

28. "Enhancing the Design and Performance of Nuclear Service Robots with Flexure Analysis, Computer Vision, and Optimization Techniques," Center for Innovative Technology, Feb. 1, 1994 to Jan. 31, 1995, with A. L. Abbott, $47,023, responsible for $35,000.

29. "Design Studies for Nautilus," Nautilus, Inc, Jan.1, 1994 to Oct. 15, 1994, $7,723, 100% responsibility.

30. "Design Studies for Nautilus," Center for Innovative Technology, Jan.1, 1994 to Dec. 31, 1994, $13,795, 100% Responsibility.

31. "Rod Formation Dynamics," R. J. Reynolds Co., Jan. 1, 1994 to Dec. 31, 1994, with D. J. Nelson, 116,557, 50% Responsibility.

32. "A Short-term Proposal to Develop Cam-Design Software for Cadkey, Inc.," June 16, 1994 to Sept 15, 1994, $9,981, 100% Responsibility.

33. "Design of an Automated Injector Body Tray Loader," Siemens Automotive, Sept. 1, 1994 to Aug. 31, 1995, $20,744, 100% Responsibility.

34. "Design Studies for Nautilus," Nautilus, Inc, Dec 1, 1994 to Nov. 30, 1995, $23,731, 100% Responsibility.

35. "Design Studies for Nautilus," Center for Innovative Technology, Dec.1, 1994 to Dec. 31, 1995, $25,924, 100% Responsibility.

36. "Preliminary design and Equipment Selection for a Mulch-Making Machine," Fred Whitaker Co., June 1, 1995 to Dec. 31, 1995, $10,920, %100 Responsibility.

37. "Improving the Kinematic Control of Robots with Computer Vision," NSF, July 15, 1995 to June 30, 1996, $22,026, %100 Responsibility.

38. "Proposal to Increase Funding in Siemens Valve-Body Loader Project, "Siemens Automotive, $7,018, 100% Responsibility.

39. "Preliminary Design and Equipment Selection for a Mulch-Making Machine," CIT, June 1, 1995 to August 31, 1995, $8,185, %100 Responsibility.

40. "Design of a Personal Smith Machine," Nautilus, Inc, July 1, 1995 to Oct. 31, 1995, $12,273, 100% Responsibility.

41. "Development of Advanced Control Strategies for Variable Geometry Truss Manipulators," Batelle -Pacific Northwest Laboratory, Jan. 1, 1995 to June 31, 1995, $10,000, with R. J. Salerno, 10% Responsibility.

42. "Curriculum Renewal in Mechanical Engineering at Virginia Tech," NSF SUCCEED, Sept. 15, 1995 to Dec. 15, 1995, with Paul Tidwell, $4,500 (NSF), $4,677 (Cost Sharing), 50% Responsibility.

43. "Development of a Parallel Architecture Robotic Wrist," Triad Investors, Jan. 1, 1996 to May 31, 1997, $51,707, 100% Responsibility.

44. "Development of Advanced Control Algorithms for Variable Geometry Truss Manipulators," Batelle-Pacific Northwest Laboratory, Jan. 1, 1996 to June 31, 1996, $10,000, 100% Responsibility.

45. "Curriculum Renewal in Mechanical Engineering at Virginia Tech – Year 5," NSF SUCCEED, June 16, 1996 to June 15, 1997, $10,000 (NSF), $10,000 (Cost Sharing), 100% Responsibility.

46. “Technology Assessment for a Robotic Vacuum Cleaner,” Servus Robots Incorporated, Sept.1, 1998 to Feb. 28, 1999 with John Bay, Bob Sturges, and Mike Deisenroth, $8,333, 25% Responsibility.

47. “Technology Assessment for a Robotic Vacuum Cleaner,” Virginia CIT, Oct.1, 1998 to March 31, 1999 with John Bay, Bob Sturges, and Mike Deisenroth, $25,000, 25% Responsibility.

48. “MBC Guidance Project,” Long-Airdox Company, August 1998 to July 1999, P.I.: R.H. Sturges, Co-P.I.’s: M. P. Deisenroth, C.F. Reinholtz. $100,000.

49. “MBC Guidance Project,” Virginia Center for Innovative Technology (matching), August 1998 to July 1999, P.I.: R.H. Sturges, Co-P.I.’s: M. P. Deisenroth, C.F. Reinholtz. $100,000.

50. “Vertical Integration of Mechatronics at Virginia Tech,” NSF SUCCEEED, Aug 1999 to July 2002, P.I.: W. R. Saunders, Co-P.I.’s: J. S. Bay, D. J. Leo, C.F. Reinholtz, $18,000/year for three years.

51. Development of a Remote-Controlled CASE CX-160 Excavator, Naval Surface Warfare Center, Dahlgren G-64 Division, February 2003 to September 2003, Co-PI with A. L. Wicks, $17,000

52. Investigation of Adaptive Structures for Morphing Aircraft, NASA Langley Research Center, $65,078, July 1,2002 to June 30, 2003, 25% (with H. Robertshaw and D. Inman).

53. Increased Scope for Delivery Orders 0019, Remote Control Excavator, Naval Surface Warfare Center, with Al Wicks, PI, $21,223.

54. Develop the Joint Unmanned Systems Experimentation and Research (JOUSTER) Site, U.S Army RDECOM STTC, Orlando, FL, June 10, 2004 to June 9, 2007, $12,200,000, C. Reinholtz, PI (55% Responsibility), A. Wicks, Co-PI (43% Responsibility), Carstensen Co-PI (2% Responsibility).

55. Virginia First Lego League 2004 Pilot High School Robotics Program, NASA Langley Research Center, Education Grant NNL04AA65G, $20,000, July 9, 2004 to July 8, 2005, 100% Responsibility

56. Virginia First Lego League NIA Outreach Program, National Institute of Aerospace, Grant No. VT-03-1, $8,000, February 1, 2005 to August 31, 2005, 100% Responsibility.

57. Heterogeneous Teams Of Autonomous Vehicles: Advanced Sensing And Control, Office of Naval Research, Dennis W. Hong, Naira V. Hovakimyan, Marty E. Johnson, Charles F. Reinholtz, Daniel J. Stilwell, A. L. Wicks, Craig A. Woolsey, Christopher L. Wyatt, 07/01/05 – 6/30/06, Total Funding: $1,050,000, C. F. Reinholtz share: $52,752.

58. Coordinated Sensing and Control for Surveillance and Tracking by Heterogeneous Autonomous Vehicle Teams, Daniel J. Stilwell, Christopher L. Wyatt, Craig A. Woolsey, Naira V. Hovakimyan, A. L. Wicks, Andy Kurdila, Charles Reinholtz and Michael Roan, Office of Naval Research 5/15/06 – 9/14/07, $1,417,500, Reinholtz share: $184,275.

59. Development Of An Autonomous Vehicle For The DARPA Urban Challenge, with Al Wicks and Dennis Hong, the Defense Advanced Research Projects Agency, 10/1/06 to 12/31/07, $999,274.

60. Development of a Drive-by-Wire Commercial Vehicle, General Dynamics Robotics Systems (GDRS), $54,256, 1-11-07 to 6-30-07.

61. Navigation And Autonomous Control For Nemesis, Applied Research Associates, Inc. (ARA), $61,513, 7-1-06 to 6-30-07

62. Dynamic Model of CAT 777-797 Haul Trucks for Autonomous Operation, Caterpillar,

$74,303, 7-1-06 to 6-30-07

63. Boeing Digitally Manufactured UAV Project, $22,740, The Boeing Company, 10-15-2010 to 12-31-2010.
64. Reconnaissance and Autonomy for Small Robots – Canine (RASR-K9), Robotic Research, $17,951.50, 1-1-2011 to 4-30-2012
65. Proposal to Develop an Autonomous Maritime System to Compete in the International Maritime Robotics Competition, AUVSI and the Office of Naval Research, $30,000, 10-1-13 to 12-31-14.
66. Robotic Tool Kit (RTK) Logistics Automation, (OTA) #W15QKN-14-9-1002, U.S. Army TARDEC via Great Lakes Systems & Technology LLC, $75,000, August 2018 through September 2019, with Patrick Currier and Eric Coyle.
67. Continued Development of Robotic Tool Kit (RTK) Logistics Automation and RTK Training, (OTA) #W15QKN-14-9-1002, U.S. Army GVSC via Great Lakes Systems & Technology LLC, $100,000, November 2019 through November 2020, with Patrick Currier and Eric Coyle.

Refereed Papers in Major Technical Journals

1. Snorri Gudmundsson, Vladimir Golubev, Sergey Drakunov and Charles Reinholtz, "Bio-Inspired Methodologies for Energy Conservation and Harvesting Flight-Path Modeling for Unmanned Aerial System," AIAA Journal of Aerospace Information Systems, Volume 16, Number 7, July 2019, https://doi.org/10.2514/1.I010597.
2. Christine M. Dailey, Charles Reinholtz, Thais Russomano, Michael Schuette, Rafael Baptista, Rodrigo Cambraia, "Resistance Exercise Machine within Lower Body Negative Pressure for Counteracting Effects of Microgravity", *Gravitational and Space Research*, Vol 2, No. 1ISSN: 0898-4697, 2014.
3. Hockley, C. J., Zuercher, T.A., Patel, H.V., Gamble, G.A., Kennedy, C.L. Coyle E.J., P.N. Currier, and C.F. Reinholtz, The Development of the ERAU Maritime RobotX Challenge Autonomous System, AUVSI North America, May 2014.
4. Jesse Hurdus, Andrew Bacha, Cheryl Bauman, Stephen Cacciola, Ruel Faruque, Peter King, Chris Terwelp, Patrick Currier, Dennis Hong, and Alfred Wicks and Charles Reinholtz, "VictorTango Architecture for Autonomous Navigation in the DARPA Urban Challenge," *AIAA Journal of Aerospace Computing, Information, and Communication*, Vol. 5, December 2008, DOI: 10.2514/1.40547.
5. Charles Reinholtz, Dennis Hong, Al Wicks, Andrew Bacha, Cheryl Bauman, Ruel Faruque, Michael Fleming, Chris Terwelp, Thomas Alberi, David Anderson, Stephen Cacciola, Patrick Currier, Aaron Dalton, Jesse Farmer, Jesse Hurdus, Shawn Kimmel, Peter King, Andrew Taylor, David Van Covern, Mike Webster, "Odin: Team VictorTango's entry in the DARPA Urban Challenge," Springer Tracts in Advanced Robotics 56, ISBN 978-3-642-03990-4, Edited by Martin Buehler, Karl Iagnemma, Sanjiv Singh, 2009.
6. Andrew Bacha, Cheryl Bauman, Ruel Faruque, Michael Fleming, Chris Terwelp, Charles Reinholtz, Dennis Hong, Al Wicks, Thomas Alberi, David Anderson, Stephen Cacciola, Patrick Currier, Aaron Dalton, Jesse Farmer, Jesse Hurdus, Shawn Kimmel, Peter King, Andrew Taylor, David Van Covern, Mike Webster, "Odin: Team VictorTango's entry in the DARPA Urban Challenge," *Journal of Field Robotics*, Vol. 25, No. 8, pg 467-492, 2008
7. David G. Schmale III, Benjamin R. Dingus, Charles Reinholtz, "Development and Application of an Autonomous Unmanned Aerial Vehicle for Precise Aerobiological Sampling Above Agricultural Fields," *Journal of Field Robotics*, Vol. 25. No. 3, pg 133-147, 2008, Copyright

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8. Michael J. Furey, Charles F. Reinholtz, and Brian Vick, “Metal Transfer, Film Formation and Surface Temperatures on a Cam in an Automotive Engine,” *Tribologia*, ISSN 0208-7774, June 2007.

9. Leedy, B., Putney, J., Bauman, C., Cacciola, S., Webster, J. M., Reinholtz, C. F., “Virginia Tech’s Twin Contenders: A Comparative Study of Reactive and Deliberative Navigation,” *Journal of Field Robotics*, 23(9), 709-727, September 2006.

10. Gombar, B., Terwelp, C., Fleming, M., Wicks, A. L. and Reinholtz, C.F., “JOUSTER: Joint Unmanned Systems Test, Experimentation and Research Facility,” *International Test and Evaluation (ITEA) Journal*, December 2004/January 2005, pp. 9-13.

11. Stephen L. Canfield, R. Randall Soper, Charles F. Reinholtz, “Creating Highly Dexterous Manipulators Using Nonlinear Input Transmission,” *ASME Journal of Mechanical Design*, Vol. 120, 1999.

12. Canfield, S. L., Soper, R. R., and Reinholtz, C. F., “Velocity Analysis of Parallel Manipulators by Truss Transformations,” *Mechanism and Machine Theory*, No. 34, 1999, pp. 345 – 357.

13. Roman, Chris and Reinholtz, C. F., “Robust Course-Boundary Extraction Algorithms for Autonomous Vehicles”, *IEEE Intelligent Systems*, Nov./Dec. 1998, pp.32-39.

14. Lee, H. Y., and C. F. Reinholtz, "Inverse Kinematics of Serial-Chain Manipulators," *ASME Journal of Mechanical Design*, Vol. 118, No. 3, September 1996, pp. 396 - 404.

15. Lee, H. Y., Fallon, J. B., Cordle, W. H., and Reinholtz, C. F., "Inverse Kinematic Analysis of a Mobile Underwater Inspection Robot,” Journal *of Applied Mechanisms and Robotics*, Vol. 2, No. 3, July 1995.

16. Canfield, S. L. and Reinholtz, C. F., "Development of an All-Revolute-Jointed Constant-Velocity Coupling," *Journal of Applied Mechanisms and Robotics*, Vol. 2, No. 3, July 1995, pp.13-19.

17. Shooter, S. B., West, R. L. and Reinholtz, C. F., A Unified Approach to Teaching Analytical Cam Design Using Conjugate Geometry, *The International Journal of Mechanical Engineering Education*, Vol. 23, No. 2, April 1995, pp 145-156.

18. Voruganti, R. S., Dhande, S. G., and Reinholtz, C. F., "Symbolic and Computational Method for Design and Flat-Pattern Development of Bifurcation, Trifurcation- Type Transition Surfaces," *Transactions of the North American Manufacturing Research Institution of SME*, Volume XXII, pp 225-232, 1994.

19. Tidwell, P. H., Glass, S. W., Hildebrand, J. J., Reinholtz, C. F., and Shooter, S. B., "COBRA - Design and Development of a Manipulator for Nuclear Steam Generator Maintenance," *Journal of Applied Mechanisms and Robotics*, Vol. 2, No. 2, April 1994.

20. Padmanabhan, B., V. Arun, and C. F. Reinholtz, "Closed-Form Inverse Kinematic Analysis of Variable Geometry Truss Manipulators," *Journal of Mechanical Design*, ASME Transactions, Vol. 114, No. 3, September 1992, pp. 438-443.

21. Arun, V., C. F. Reinholtz, and L. T. Watson, "Application of New Homotopy Techniques to Variable Geometry Trusses," *Journal of Mechanical Design*, ASME Transactions, Vol. 114, No. 3, September 1992, pp. 422-427.

22. Voruganti, R. S., Dhande, S. G., and Reinholtz, C. F., "Symbolic and Computational Conjugate Geometry for the Manufacture of Helically Swept Surfaces," *Transactions of the North American Manufacturing Research Institution of SME*, Volume XX, pp 277-282, 1992.

23. Salerno, R. J., Reinholtz, C. F., and Dhande, S. G., "Kinematics of Long-Chain Variable Geometry Truss Manipulators," *Advances in Robot Kinematics*, pp. 179-187, Edited by S. Stifter and J. Lenarcic, Springer-Verlag Wien, New York, 1991.

24. Kosmatka, J. B., R. F. Fries, and C. F. Reinholtz," Tension and Bending Stress Concentration Factors in U, V, and Opposed U-V Notches," *The Journal of Strain Analysis for Engineering Design*, Vol. 25, No. 4, 1990, 233-240.

25. Rogers, C. A., H. H. Mabie, and C. F. Reinholtz, "Design of Spur Gears Generated with Pinion Cutters," *Mechanism and Machine Theory*, Vol. 25, No. 6, 1990, pp. 623-634.

26. Mabie, H. H., C. A. Rogers, and C. F. Reinholtz, "Design of Spur Gears Cut by a Hob," *Mechanism and Machine Theory*, Vol. 25, No. 6, 1990, pp. 635-644.

27. Williams, II, R. L., and C. F. Reinholtz, "Proof of Grashof's Law Using Polynomial Discriminants," *Journal of Mechanisms, Transmissions and Automation in Design*, ASME Transactions, Vol. 109, No. 2, June 1987, pp. 178-182.

28. Reinholtz, C. F., G. N. Sandor, and J. Duffy, "Branching Analysis of Spherical RRRR and Spatial RCCC Mechanisms," *Journal of Mechanisms, Transmissions and Automation in Design*, ASME Transactions, Vol. 108, No. 4, Dec. 1986, pp. 481-486.

29. Williams, II, R. L., and C. F. Reinholtz, "Mechanism Link Rotatability and Limit Position Analysis Using Polynomial Discriminants," *Journal of Mechanisms, Transmissions and Automation in Design*, ASME Transactions, Vol. 108, No. 4, Dec. 1986, pp. 562-564.

30. Myklebust, A., M. J. Keil and C. F. Reinholtz, "MECSYN-IMP-ANIMEC: Foundation for a New Computer-Aided Spatial Mechanism Design System," *Mechanism and Machine Theory*, Vol. 20, No. 4, 1985, pp. 257-269.

31. Reinholtz, C. F., S. G. Dhande, and G. N. Sandor, "Kinematic Analysis of Planar Higher-Pair Mechanisms," *Mechanism and Machine Theory*, Vol. 13, No. 6, 1978, pp. 619-629.

Notes, Review Articles, and Shorter Communications in Major Technical Journals

1. Fallon, J. B., and C. F. Reinholtz, "Simple Machine," short article published in the 1993 Edition of Academic American Encyclopedia, Deluxe Library Edition, Grolier, Inc., Vol. S, p. 316. Also published in the 1994 New Grolier Multimedia Encyclopedia, CD ROM Edition.

2. Fallon, J. B., and C. F. Reinholtz, "Machine," article published in the 1993 Edition of Academic American Encyclopedia, Deluxe Library Edition, Grolier, Inc., Vol. M, pp. 19-21. Also published in the 1994 New Grolier Multimedia Encyclopedia, CD ROM Edition.

3. Sandor, G. N., S. G. Dhande, and C. F. Reinholtz, discussion of "Reduction of Noise and Vibration in Roller Chain Drives," by S. W. Nicol and J. N. Fawcett, *Proceedings of the Institution of Mechanical Engineers*, Vol. 191 39/77, 1978.

4. Sandor, G. N., S. G. Dhande, and C. F. Reinholtz, discussion of "The Influence of Lubrication on Tooth-Roller Impacts in Chain Drives," by J. N. Fawcett and S. W. Nicol, *Proceedings of the Institution of Mechanical Engineers*, Vol. 191 21/77, 1978.

5. Reinholtz, C. F., review of the book Mechanics and Design of Cam Mechanisms, Pergamon Press, authored by F. Y. Chen, review published simultaneously in *Mechanism and Machine Theory*, Vol. 24, No. 4, 1985, and in *Shock and Vibration Digest*, Vol. 17, No. 12, 1985.

Books and Book Chapters

Mabie, H. H., and C. F. Reinholtz, Mechanisms and Dynamics of Machinery, 4th edition, with Solutions Manual, John Wiley and Sons, New York, 1987.

Teaching Excellence at a Research-Centered University, Edited by E. Scott Geller and Phil Lehman, Pearson Custom Publishing, Chapter 30: BRINGING THE BEST OUT OF STUDENTS: Teaching beyond the Classroom, 2006

Proceedings and Textbooks Edited

1. "Robotics, Spatial Mechanisms, and Mechanical Systems," Proceedings of the 22nd ASME Mechanisms Conference, DE-Vol. 45, September 1992, 644 Pages, Edited by G. Kinzel, C. Reinholtz, H. Lipkin, L. W. Tsai, G. R. Pennock and R. J Cipra.
2. "Mechanism Design and Synthesis," Proceedings of the 22nd ASME Mechanisms Conference, DE-Vol. 46, September 1992, 672 Pages, Edited by G. Kinzel, C. Reinholtz, G. R. Pennock, G. J. Wiens, R. J. Cipra, B. B. Thompson and T. R. Chase.
3. "Flexible Mechanisms, Dynamics, and Analysis," Proceedings of the 22nd ASME Mechanisms Conference, DE-Vol. 47, September 1992, 662 Pages, Edited by G. Kinzel, C. Reinholtz, H. Lipkin, L. W. Tsai, G. R. Pennock, R. J Cipra and B. B. Thompson.
4. Sandor, G. N., C. F. Reinholtz, and K. Soldner, errata to the book, *Mechanics and Design of Cam Mechanisms*, authored by F. Y. Chen, Pergamon Press, Inc., Elmsford, N.Y., 1982, 10 pages.

Conference Publications

1. Casey Troxler, Patrick Currier, Charles Reinholtz, “Impact of Automated Lane Change Assist on Energy Consumption,” SAE Technical Paper 2020/4/14.
2. Gudmundsson, Snorri, Vladimir Golubev, Sergey Drakunov, Charles Reinholtz, “Bio-Inspired Opportunistic Approaches in Energy-Conserving/Harnessing Flight-Path Modeling for UAS,” AIAA Modeling and Simulation Technologies Conference, AIAA Aviation and Aeronautics Forum and Exposition 2016.
3. Christopher Hockley, Timothy Zuercher, Christopher Kennedy, Gene Gamble, Hitesh Patel, Patrick Currier, Eric Coyle, Charles Reinholtz, “System Architecture, Development and Results of the Embry-Riddle Aeronautical University Maritime RobotX Platform,” Control ID#: 2028351, Session: UMS-02, Unmanned Systems: Technologies and Applications, AIAA Science and Technology Forum 2015.
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Patents

1. “Spatial, Parallel-Architecture, Robotic Carpal Wrist,” U. S. Patent 5,699,695, Inventors: Canfield, S. L., Reinholtz, C. F., Salerno, R. J., and Ganino, Anthony J., Assignee: Virginia Tech Intellectual Properties, Inc., Awarded December 23, 1997.

2. "Snubber Profile," U. S. Patent 4,998,942, Inventor: Reinholtz, Charles F. Assignee: Milliken Research Corporation, Spartanburg, S.C., Awarded March 12, 1991.

Invited Presentations at National Meetings

1. “Test Drive an Autonomous Vehicle: Experiences from the 2007 DARPA Urban Challenge,” Presentation to USAA, 19 January 2009, San Antonio, TX

2. “Challenges and Opportunities Offered by the DARPA Grand Challenge,” Invited Presentation and Panel Discussion at the 2004 AIAA Unmanned Aerial Vehicle Conference, Chicago, IL, September 2004.

3. “Product Safety and Product Liability,” Invited Lecture at the 2001 ASME World Congress, New York, NY, Nov.13, 2001
4. "Life after Tenure"' Invited Speaker and Panelist at the ASEE Annual Conference and Exposition, Charlotte NC, June 20-23, 1999.
5. “Reduced Complexity Robotics,” Invited presentation at the 1998 ASME Design Technical Conferences, 25th Biennial Mechanisms Conference, Atlanta, GA, September 1998.
6. "Trends and Opportunities in Mechanisms Research," Plenary Panel Session Speaker at the 4th National Applied Mechanisms and Robotics Conference, Cincinnati, Ohio, December 10-14, 1995.
7. "Trends and Opportunities in Robotics," Opening Plenary Session Lecture at the 10th Applied Mechanisms Conference, Dec. 6-9, 1987, New Orleans, Louisiana.
8. "Observations on Robotics and Mechanisms Research," Opening Plenary Panel Session Speaker at the 2nd National Applied Mechanisms and Robotics Conference, November 3-6, 1991, Cincinnati, Ohio, November 3-6, 1991.

University Service

Invited Speaker at the following University Events and Alumni Association Chapter Meetings:
June 23, 2005, Research Triangle Park Alumni Chapter, Raleigh, NC
March 18, 2004, Greensboro, NC Triad Alumni Chapter
March 31, 2004, Atlanta Alumni Chapter
November 1, 2004, Committee of 100 - Hotel Roanoke
November 21, 2004, Class of 1968, Donaldson Brown

Advisor to the following Embry Riddle Autonomous Vehicle Teams:
Unmanned Aerial Systems Competition, 2007-Present
International Aerial Robotics Competition, 2007-Present
Intelligent Ground Vehicle Competition, 2007-Present
RoboBoat, 2007-Present
RoboSub, 2007-Present
Maritime RobotX Competition,2013-Present
EcoCAR (CAVs Advisor), 2016-Present
Member, College Promotion and Tenure Committee 2018-21
Fulbright Scholarship Advisory Committee 2005
Advisor to the Virginia Tech Autonomous Aerial Vehicle Competition Team, 2004-
Advisor to the Virginia Tech DARPA Grand Challenge Team, 2003-
Virginia FIRST Lego League Coordinator, 2002-
Advisor to the Virginia Tech Intelligent Ground Vehicle Competition Team, 1995-
Advisor to Entering Honors Students 2003-
Horton Honors Scholarship Selection Committee 2003-
Member, University Strategic Planning Committee, 2001
Chair, Virginia Tech Academy of Teaching Excellence 2000-2001
Vice Chair, Virginia Tech Academy of Teaching Excellence 1999-2000
Member, University Promotion and Tenure Committee 2000-2001
Member, College Promotion and Tenure Committee 2000-2001
Chair, Mechanical Engineering Curriculum Committee 1997-2002
Chair, Mechanical Engineering ABET Review, 1998-2002
Member, College of Engineering Curriculum Committee 1997-2002
Member, 1st Year Special Curriculum Review Committee 1997
Member, Engineering Dean Search Committee, 1993-4
Chairman, Mechanical Engineering Honors and Awards and Publicity Committee, 1993-99
Member, Mechanical Engineering Honors and Awards and Publicity Committee, 1993-99

Chairman, College Wine Teaching Award Committee, 1992-95
Chairman, University Wine Teaching Award Committee, 1995-96
Member, Mechanical Engineering Department Head Search Committee, 1992-93
Member, Mechanical Engineering Curriculum Committee, 1984-87, 1992-2004
Member, Mechanical Engineering Tenure and Promotion Committee, 1989-2004
Member, Mechanical Engineering Graduate Committee, 1987-89
Member, Mechanical Engineering Recruiting Committee, 1992-93
Member, Sigma Xi High School Teaching Award Committee 1987-88, Chairman 1989
Member, College of Engineering Commencement Committee, 1988-
Faculty Advisor to the Virginia Tech Student Section of ANS, 1993-
Faculty Advisor to the Virginia Tech Student Section of ASME, 1988-
Faculty Advisor to the Virginia Tech Chapter of Tau Beta Pi, 1984-88
Host for the Virginia Tech Academic Challenge, 1991

Professional Service

Society	Positions Held
ASME	Secretary of the Virginia Section 1987-92
	Chairman of the National Student Mechanism Competition 1987-88
	Chairman of the Joint Regional Conference 1989 and 2000
	Virginia Tech Student Section Advisor, 1988-2007
	Member of the ASME Mechanisms Committee, 1990-1993
	Associate Technical Editor, *ASME Journal of Mechanical Design*, 1991-93
	Paper Review Chairman, 22nd ASME Mechanisms Conference, Sept. 1992
	Conference Arrangements Chairman, 23rd ASME Mechanisms Conference, Sept. 1994
	Member, ASME National Design Contest Committee, 1996-2002
	Virginia Section Newsletter Editor, 1994-2000
	Region IV Senior Representative to the National Student Sections Committee, 1995-2000
Sigma Xi	High School Teaching Award Committee, Member 1987-88, Chair 1989
ANS	Student Section Advisor, Virginia Tech, 1993-95
NAE	Invited review Board member, National Academies' National Research Council (NRC) Army Research Laboratory Technical Assessment Board (ARLTAB), May 2004

Graduate Advising

Master's Degree Students Completed				
	Degree	**Name**	**Completion Date**	**Title**
1	MS	Robert L Williams, II	8/85	Synthesis and Design of the RSSR Spatial Mechanism for Function Generation
2	MS	Arun Veeraraghavan	3/86	Computer Aided Design of the RCCC Spatial Mechanism
3	MS	Michael A. Klatt	10/86	Design Optimization of Planar Mechanisms
4	MS	Kevin K. Moyers	11/87	A Microcomputer-Based Data Acquisition System for Diagnostic Monitoring of High-Speed Electric Motors
5	MS	Christodoulos S. Demetriou	12/87	A PC Implemented Kinematic Synthesis System for Planar Mechanisms
6	MS	Dipen P. Gokhale	12/87	Kinematic Analysis and Animation of a Variable-Geometry Truss Robot
7	MS	William R. Seith	5/88	Design of a Flying Cutter
8	MS	George M. Clessas	5/88	Direct Calculation of Cable Tension in a Store Separation Program Which Models the Launch of an Aerial Tow Target
9	MS	Mark W. Biegler	8/88	Determination of Stress Concentration Factors Using Experimental Methods
10	MS	Nandan Joshi	2/88	Mobility Analysis of Variable-Geometry Trusses
11	MS	Vasant Marathe	12/88	Design of a Hot Melt Book Binding Machine
12	MS	Babu Padmanabhan	12/88	Design of a Robotic Manipulator Using Variable-Geometry Trusses as Joints
13	MS	Robert J. Salerno	6/89	Shape Control of High Degree-of-Freedom Variable-Geometry Truss Manipulators
14	MS	Ravinder S. Voruganti	8/90	Symbolic and Computational Conjugate Geometry for Design and Manufacturing Applications
15	MS	Steven B. Shooter	12/90	Conceptual Manipulator Design for Limited Access Workspaces
16	MS	Paul Mele	5/91	Mechanical Design of a Stewart Platform-Based Crawling Vehicle
17	M.S.	William K. Carpenter	12/92	Design of Medical Waste Treatment Systems Employing Bioremediation
18	MS	Allen Maples	5/93	Design of a Robust Acoustic Positioning System for an Underwater Nuclear Reactor Vessel Inspection Robot
19	MS	William Cordle	5/93	Numerical Inverse Kinematics for a Six Degree-of-Freedom Manipulator
20	MS	Glenn Melnyk	6/93	Mechanisms for Automated Toolhead Changing in Nuclear Steam Generator Robotics
21	MS	Steve Payne	5/94	A CAD-Interactive Software Package for the Synthesis of Planar Disk Cams
22	MS	Anil K. Garg	8/94	Design, Installation and Testing of a Bioremediation-Based System for Treating Regulated Medical Waste
23	MS	Todd Denkins	12/94	Design Methodology to reduce the Number of Actuators in Complex Mechanisms

24	MS	Joseph Calkins	12/94	Real-Time Compensation of Static Deflections in Robotic Manipulators
25	MS	Randy Soper	8/95	Synthesis of Planar Four-Link Mechanisms for Force Generation
26	MS	Keith Garguilo	8/95	Design and Testing of a Nonlinear Mechanical Advantage Demonstration Mechanism
27	MS	Ganino, A. J.	5/96	Mechanical Design of the Carpal Wrist: A Parallel-Actuated, Singularity-Free Robotic Wrist
28	MS	Larkin, Susan	6/96	Wheeled Autonomous Mobile Robots for use in Harsh Environments: A Survey of Recent Publications
29	MS	Iskandar, Kurnia	6/96	Computer Assisted Synthesis of Wrapping Cam Mechanisms
30	MS	Riutort, Kevin	7/96	Applied Design and Implementation of Straight-Line Mechanisms
31	MS	Saccoccio, Greg	8/96	Error Modeling of the Carpal Wrist
32	MS	Scardina, Mike	10/96	Optimal Synthesis of Force-Generating Planar Four-Link Mechanisms
33	MS	Palmer, Matthew	12/96	Kinematics of Beam-Flexure Four-Bar Linkages with Applications in a Compound Bow
34	MS	Coombs, Dana	2/97	Design of User-Weight-Based Exercise Machines
35	MS	Doyle, Matthew	12/97	The Foundation for CADSPAM
36	MS	Hayes, Thomas J.	12/97	The Creative Entrepreneurs Organization
37	MS	Adler, Alex	5/98	Testing and Understanding Screwdriver Bit Wear
38	MS	Haynie, C. Dean	8/98	Mechanical Design and Navigation Strategies for a Zero-Turn-Radius Autonomous Vehicle
39	MS	Holland, Michael	12/98	Assembly Optimization for Double-Row Ball Bearings
40	MS	Abbott, Michael	6/00	Dynamics and Control of the Biplanar Bicycle
41	MS	Conner, David	8/00	Sensor Fusion, Navigation, and Control of Autonomous Vehicles
42	MS	Jillcha Wakjira	1/01	Design of a SMA Heat Engine
43	MS	Carr, Angela	5/01	Position Control Comparison of Equilibrated and Mass Counterweight Systems
44	MS	Kedrowski, Philip	5/01	Development and Implementation of a Self-Building Global Map for Autonomous Navigation
45	MS	Blackett, Ricardo	5/01	Optimization of Multi-Degree-of-Freedom Force Generating Mechanisms
46	MS	Matthew Thompson	7/01	Design of a Cyclic Sliding, Dynamically Loaded Wear Testing Device for the Evaluation of Total Knee Replacement Materials
47	MS	Rundgren, Brian	12/01	Design and Optimization of Force Generation Linkages to Include Dynamic Effects
48	MS	Schiller, Ean	9/02	Heat Engine Driven by Shape Memory Alloys: Prototyping and Design

49	MS	Gopinath, Sudir	12/02	Using Color and Shape Analysis for Boundary Line Extraction in Autonomous Vehicle Applications
50	MS	Whittier, Will	12/02	Kinematic Analysis of Tensegrity Structures
51	MS	Terwelp, Chris	5/03	Remote Control of Hydraulic Equipment for Unexploded Ordnance Remediation
52	MS	Henshaw, Graham	5/03	Single-Session Design: Design Methodology in Compressed Timeframes Derived from the Robot Rivals Television Series
53	MS	Corey, Chris	12/03	Epicyclic Gear Train Solution Techniques with Application to Tandem Bicycling
54	MS	Fleming, Michael	12/03	Teleoperated Control of Hydraulic Equipment for Hazardous Material Handling
55	MS	Stubbs, Matthew	12/03	Kinematic Design and Analysis of a Morphing Wing
56	MS	Bacha, Andrew	5/05	Line Detection and Lane Following for an Autonomous Robot
57	MS	Frentzel, John	5/05	A Wireless Instrumented Payload for Testing Unmanned Vehicles
58	MS	Naik, Ankur	12/05	Arc Path Collision Avoidance Algorithm for Autonomous Ground Vehicles
59	MS	Barnett, Shane	12/05	Development of a Tow Capacity Test Device for Small Unmanned Vehicles
60	MS	Cooper, Jared	12/05	Modeling of a Small-Scale Remote Controllable Helicopter for Simulation and Control Development
61	MS	Baity, Sean	5/06	Development of a Next-generation Experimental Robotic Vehicle (NERV) that Supports Intelligent and Autonomous Systems Research
62	MS	Leedy, Brett	5/06	Two Minds for One Vehicle: A Case Study in Deliberative and Reactive Navigation
63	MS	Gombar, Brett	5/06	Design and Evaluation of a Mobile Instrumentation Platform for Unmanned Vehicle Testing
64	MS	Putney, Joseph	5/06	Reactive Navigation of an Autonomous Ground Vehicle Using Dynamic Expanding Zones
65	MS	Willis, Christopher Ryan	5/06	A Kinematic Analysis and Design of a Continuously Variable Transmission
66	MS	James Hayward Bittorf	6/06	Mechanical Device to Assist the Landing of Unmanned Aerial Vehicles
67	MS	Ramirez, Rachael	8/06	Computer Vision Based Analysis of Broccoli for Application in a Selective Autonomous Harvester
68	MS	Grant Edward Gothing	7/07	Development of the “Discretized Dynamic Expanding Zones with Memory” Autonomous Mobility Algorithm for the Nemesis Tracked Vehicle Platform
69	MS	David Burns Van Covern	7/07	Collaborative Target Localization and Inspection Using a Heterogeneous Team of Autonomous Vehicles
70	MS	Thomas James Alberi	4/08	A Proposed Standardized Testing Procedure for Autonomous Ground Vehicles

71	MS	Patrick Norman Currier	4/08	Development of an Automotive Ground Vehicle Platform for Autonomous Urban Operations
72	MS	Jesse Lee Farmer	2/08	Kinematic Analysis of a Two Body Articulated Robotic Vehicle
73	MS	Chris Hockley	12/10	Development of an Autonomous Monocopter
74	MS	Katrina Corley	4/11	Supervisory Autonomous Control of Homogeneous Teams of Unmanned Ground Vehicles: Application to The Multi-Autonomous Ground-Robotic International Challenge
75	MS	Robert Andrew Lister	5/11	Classification of Marine Vessels in a Littoral Environment Using a Novel Training Database
76	MS	Kevin Rigby	8/11	Localization of Aircraft Using Wide-Baseline Stereopsis
77	MS	Lafe Zabowski	8/11	A Low Cost, Computer Vision Based, Target Tracking Hexapod
78	MS	Christine Dailey	5/12	A Novel Resistance Exercise Machine for Use in a Lower Body Negative Pressure Box to Counteract the Effects of Weightlessness

Ph.D. Students Completed				
1	PhD	Robert L. Williams II	5/88	Planar Robotic Mechanisms: Analysis and Configuration Comparison
2	PhD	Arun Veeraraghavan	9/90	The Solution of Variable-Geometry Truss Problems Using New Homotopy Continuation Methods
3	PhD	Shahriar Tavakkoli	6/91	Shape Design Using Intrinsic Geometry
4	PhD	Babu Padmanabhan	12/92	A Study of Isostatic Framework with Application to Manipulator Design
5	PhD	Robert J. Salerno	12/93	Positional Control Strategies for a Modular, Long-Reach, Truss-Type Manipulator
6	PhD	Paul Tidwell	8/95	Wrapping Cam Mechanisms
7	PhD	J. Barry Fallon	8/95	Improving the Kinematic Control of Robots by Estimating the End-Effector Pose Directly with Computer Vision
8	PhD	Steven B. Shooter	12/95	Information Modeling in Mechanical Design: With Application to Cam Mechanism Design
9	PhD	Ravi S. Voruganti	12/95	Robot System Characterization: Error Modeling, Identification, Analysis and Calibration
10	PhD	Canfield, Steve	5/98	Development of the Carpal Wrist
11	PhD	Stulce, John	1/02	Conceptual Design of a Multibody Passive-Legged Crawling Vehicle
12	PhD	Calkins, Joseph	8/02	Quantifying Coordinate Uncertainty Fields in Coupled Spatial Measurement Systems
13	PhD	Snorri Gudmundsson	12/16	A Biomimetic, Energy-Harvesting, Obstacle-Avoiding, Path-Planning Algorithm for UAVs