

## Resume

### Robert A. Altenkirch

#### Personal

*Home Address:* 210 Williams SE Ave  
Huntsville, AL 35801

*Home Phone:* (256)-534-4813

*Office Address:* 370 Shelbie King Hall  
The University of Alabama in Huntsville  
310 Sparkman Drive  
Huntsville, AL 35899

*Office:* Phone: (256)-824-6340  
Fax: (256)-824-6538  
e-mail: robert.altenkirch@uah.edu

*Birthdate :* 13 May 1948

*Birthplace :* St. Louis, Missouri, USA

*Marital Status :* Married, two children

#### Education

HS Diploma Affton High School, St. Louis County Missouri, 1966  
BSME Purdue University, 1970  
MS University of California, Berkeley, 1971  
PhD Purdue University, 1975

#### Professional Employment

2011-pres President and Professor of Mechanical and Aerospace Engineering, The University of Alabama in Huntsville, Huntsville, AL

2002-2011 President and Distinguished Professor of Mechanical Engineering  
New Jersey Institute of Technology, Newark, NJ

1998-2002 Vice President for Research and Professor of Mechanical Engineering  
Mississippi State University, Mississippi State, MS

1995-1998 Professor of Mechanical and Materials Engineering and Dean of the College of Engineering and Architecture, Washington State University, Pullman, WA

1988-1995 Professor of Mechanical Engineering and Dean of the College of Engineering, Mississippi State University, Mississippi State, MS

1985-1988 Professor of Mechanical Engineering, University of Kentucky, Lexington, KY

1984-1988 Chairman of Mechanical Engineering, University of Kentucky, Lexington, KY

1980-1985 Associate Professor of Mechanical Engineering, University of Kentucky, Lexington, KY

- 1975-1980 Assistant Professor of Mechanical Engineering, University of Kentucky, Lexington, KY
- 1971-1975 Graduate Instructor of Research, School of Mechanical Engineering, Purdue University, West Lafayette, IN
- 1970-1971 Cummins Engine Company Fellow, Department of Mechanical Engineering, University of California, Berkeley, Berkeley, CA

## Professional Activities

### *Society Memberships*

Phi Eta Sigma; Pi Tau Sigma; Tau Beta Pi; Sigma Xi; The Combustion Institute; American Society for Engineering Education (ASEE); American Society of Mechanical Engineers (ASME); Mississippi Engineering Society; National Society of Professional Engineers; Phi Kappa Phi

### *Reviewer*

NASA Space Station Experiments on Solid Fuel Ignition and Extinction (2014); Combustion Theory and Modelling; International Journal of Heat and Mass Transfer; National Science Foundation; United States Department of the Interior-Bureau of Mines; ASME Technical Meetings; Journal of Heat Transfer (ASME); Combustion Science and Technology; AICHe Journal; Journal of Energy (AIAA); AIAA Journal; Fuel; Combustion and Flame; The Combustion Institute International Symposia; Journal of the American Society of Agricultural Engineers; National Bureau of Standards; National Aeronautics and Space Administration; Chemical Engineering Communications; Experimental Thermal and Fluid Science; NASA University Space Engineering Research Centers

### *Technical Meeting Organization*

- 1997 Symposium Co-Organizer, Symposium on Combustion, Fire, Explosion, and Alternate Fuels, ASME International Mechanical Engineering Congress and Exposition, Dallas, Texas
- 1994 Session Chairman, Flame Spread over Thin Fuels, Twenty-Fifth International Symposium on Combustion, Irvine, California
- 1992 Session Chairman, Flame Spread, Twenty-Fourth International Symposium on Combustion, Sydney, Australia.
- 1991 Session Chairman, Fire Spread, Eastern Section of The Combustion Institute, Ithaca, NY.  
Program Committee; Session Chairman, Soot, Central States Section/The Combustion Institute, Nashville, TN.
- 1990 Session Chairman, Microgravity Combustion, Twenty-Third International Symposium on Combustion, Orleans, France.  
Session Chairman, Chemical Kinetics, Central States Section/The Combustion Institute, Cincinnati, OH.
- 1989 Session Chairman, Coal Combustion, Central States Section/The Combustion Institute, Dearborn, MI.

- 1988 Session Chairman, Experimental Techniques in Combustion, ASME Winter Annual Meeting, Chicago, IL.
- Session Chairman, Twenty-Second International Symposium on Combustion, Seattle, WA.
- 1987 Session Chairman, Modelling of Combustion, ASME/JSME Thermal Engineering Joint Conference, Honolulu, HI.
- 1986 Session Chairman, Modelling of Combustion Systems, ASME Winter Annual Meeting, Anaheim, CA.
- Session Chairman, Twenty-First International Symposium on Combustion, Munich, FRG.
- Session Chairman, Coal Combustion, Central States Section/The Combustion Institute, Cleveland, OH.
- 1985 Session Chairman, Coal Combustion, Joint Technical Meeting Central States-Western States Section/The Combustion Institute, San Antonio, TX.
- Session Co-chairman, Radiation in Combustion Systems, ASME/AIChE National Heat Transfer Conference, Denver, CO.
- 1983 Session Chairman, Heat Transfer in Fires and Flame Spread-II, ASME/AIChE National Heat Transfer Conference, Seattle, WA.
- Meeting Chairman, Spring Technical Meeting, Central States Section/The Combustion Institute, Lexington, KY.
- 1982 Session Chairman, Heat Transfer in Coal Combustion, ASME Winter Annual Meeting, Phoenix, AZ.
- Session Chairman, Fundamentals of Combined Mode Heat Transfer: Convection and Radiation, AIAA/ASME Third Joint Thermophysics, Fluids, Plasma & Heat Transfer Conference, St. Louis, MO.
- 1978 Session Chairman, Coal Combustion and Fluidization, Fifth Annual DOE/Fossil Energy Conference on University Coal Research, Lexington, KY.

*Committees/Boards*

- 2013-present NASA Research Subcommittee of the Human Exploration and Operations Committee of the NASA Advisory Council
- 2011 New Jersey Commission on Science and Technology
- 2011 New Jersey Alliance for Action
- 2011 Newark (NJ) Alliance
- 2011 Newark (NJ) Workforce Investment Board
- 2008-2011 Governor's Steering Committee on Financial Restructuring and Debt Reduction, State of New Jersey

2006-2011	Board of Trustees, Newark Boys Chorus School
2006-2011	New Jersey Economic Growth Council
2006-2010	Chairman of the Board, Newark Downtown Core Redevelopment Corporation
2005-2011	Board of Trustees, Newark Public Schools Foundation; later Newark Education Trust
2005-2011	Board of Directors, New Jersey Technology Council
2004-2005	Governor's Commission on Base Realignment and Closure, State of New Jersey
2004-2011	Board of Directors, Institute for Entrepreneurial Leadership, Newark, New Jersey
2003-2011	Legislature's Amistad Commission, State of New Jersey
2003-2004	Governor's Commission on Job Growth and Economic Development, State of New Jersey
2003-2004	Mayor's Blue Ribbon Commission on Downtown Core Redevelopment, Newark, New Jersey
2003	Governor's Blue Ribbon Commission on Transportation, State of New Jersey
2002-2011	Board of Directors, R&D Council of New Jersey
2002	Board of Trustees, Prosperity New Jersey
2002-2003	Review, Planning and Implementation Steering Committee of the Governor's Commission on Health Science, Education, and Training, State of New Jersey
2002-2011	Board of Trustees, University Heights Science Park, Newark, New Jersey; Chair 2004-2011
2000-2002	Board of Directors, EPSCoR Foundation
2000-2003	Board on Assessment of NIST, National Research Council Commission on Physical Sciences, Mathematics, and Applications
1999-2002	Board of Directors, Mississippi State University Research and Technology Corporation (President of the Corporation in odd years; Vice President in even years)
1999-2002	Board of Directors, EPSCoR Coalition (liaison to EPSCoR lobbying firm; Treasurer 1999; Vice Chair 2000-01; Chair 2002)
1998-2002	Board of Directors, Golden Triangle Enterprise Center
1998-2002	Vice Chair, Governing Council, Partnership for Natural Disaster Relief
1998-2002	Mississippi EPSCoR Committee, Project Director and Coalition Representative

1998-2002	Mississippi University Research Authority
1998-2002	Mississippi Research Consortium (Chair 2001-2003)
1998-2003	Board on Assessment of NIST Programs' Panel for Building and Fire Research, National Research Council Commission on Physical Sciences, Mathematics, and Applications, Vice Chair 2001-2002, Chair 2003
1995-1998	Board of Directors, Washington Technology Center
1995-1999	Space Studies Board's Committee on Microgravity Research, National Research Council Commission on Physical Sciences, Mathematics, and Applications.
1994-1996	Board of Directors, Southeastern Consortium for Minorities in Engineering
1993-1996	Board of Governors Task Force on Electronic Networking, American Society of Mechanical Engineers.
1993-1997	Member-At-Large, Council on Education, American Society of Mechanical Engineers
1992	Member, NASA Microgravity Combustion Discipline Working Group
1991-1993	Past Chairman and Board of Advisors, Central States Section/The Combustion Institute
1989-1991	Chairman, Central States Section/The Combustion Institute
1989	Panel Member, NASA Space Station Freedom Modular Combustion Facility Assessment Workshop, NASA-Lewis Research Center.
1987-1989	Director, Board of Advisors, Central States Section/The Combustion Institute
1985	Space Station Advisory Group, George C. Marshall Space Flight Center, NASA
1984-1987	Microgravity Combustion Sciences Discipline Working Group, NASA
1984-1987	Board of Advisors, Central States Section/The Combustion Institute
1981-1982	Requirements Working Group, Universities Space Research Association group to study design concepts for reduced-gravity, experimental combustion facilities considered by NASA
1980	Charter Member, ASME Heat Transfer Division K-11 Committee on Heat Transfer in Fire and Combustion Systems.
1979	Member, Automotive Emissions Committee, Society of Automotive Engineers

#### **Awards and Honors**

2009	Recognized as one of the 101 most influential people in New Jersey, <i>New Jersey Monthly</i> , January 2009
2008	Ellis Island Medal of Honor

- 2007 Distinguished Engineering Alumnus, College of Engineering, Purdue University
- 2001 Outstanding Mechanical Engineer Alumnus Award, School of Mechanical Engineering, Purdue University
- 1993 Fellow, American Society of Mechanical Engineers
- 1984 Gustus L. Larson Memorial Award given by Pi Tau Sigma and the American Society of Mechanical Engineers for outstanding achievements in mechanical engineering within ten to twenty years following graduation with a BS degree.
- 1980 College of Engineering, University of Kentucky Outstanding Research Paper Award for a paper entitled "Buoyancy Effects on Flames Spreading Down Thermally Thin Fuels," by R.A. Altenkirch, R. Eichhorn, and P.C. Shang, *Combustion and Flame* 37, 71-83 (1980).
- 1979 Ralph R. Teetor Award given by the Society of Automotive Engineers for significant contributions to teaching, research, and student development.

### Areas of Research Specialization

#### *Combustion and Heat Transfer*

Convection and radiation heat transfer  
 Numerical modelling  
 Flame spreading over solid and liquid fuels  
 Pool fires of liquid fuels  
 Buoyancy effects on flames  
 Low-gravity combustion  
 Microgravity experimentation  
 Chemistry of pulverized-coal combustion  
 Infrared pyrometry applied to pulverized-coal combustion  
 Radiative properties of soot in flames

### Grants and Contracts

- 2002-05 Mississippi EPSCoR Research Infrastructure Improvement, National Science Foundation; \$6,000,000.
- 2001-02 Entrepreneurial Regional Initiative for the Greater Golden Triangle Incubator, Appalachian Regional Commission, \$200,000.
- 2001-03 Construction of Incubator Facility for Mississippi Technology Business Incubator Partnership, US Department of Commerce, Economic Development Authority; \$1,500,000.
- 2000-02 Greater Golden Triangle Regional Small Business Incubator Network, Tennessee Valley Authority; \$800,000.
- 1999-02 Mississippi Experimental Program to Stimulate Competitive Research (EPSCoR) Infrastructure Program (Project director), National Science Foundation; \$3,000,000.
- 1994-99 Reflight of the Solid Surface Combustion Experiment with Emphasis on Flame Radiation near Extinction, National Aeronautics and Space Administration; \$355,166; with Subrata Bhattacharjee (San Diego State University), Kurt Sacksteder (NASA) and Michael Delichatsios (Factory Mutual Research Corporation) as CO-PI's; flame spread experiments conducted on two Space Shuttle flights.

- 1995 Opposed-Flow Flame Spread on Cylindrical Surfaces in MGBX, Space Shuttle-based Glovebox experiment in conjunction with the Solid Surface Combustion Experiment; no additional funding beyond flight opportunity; flame spread experiments conducted on one Russian MIR mission.
- 1991-98 Low-Velocity, Opposed-Flow Flame Spread in a Transport-Controlled, Microgravity Environment, National Aeronautics and Space Administration; \$714,771; with Sandra Olson (NASA) and Subrata Bhattacharjee (San Diego State University) as CO-PI's; flame spread experiments conducted on four Sounding Rocket experiments.
- 1992 Incorporation of Multi-Step Reaction Chemistry and Non-Unit Lewis Number Effects in Solid Surface Flame Spread Modelling, National Aeronautics and Space Administration; \$66,000; 3 years; graduate student training grant for M. Katherine Wolverton.
- 1987 Determination of Local Radiative Properties in Coal-Fired Flames, Department of Energy; \$199,963; 3 years; CO-PI with M. Pinar Menguc.
- A Study of Oil-Slick Combustion, National Bureau of Standards; \$40,000; 1 year; CO-PI with Kozo Saito.
- 1984 Scientific Support for an Orbiter Middeck Experiment on Solid Surface Combustion, National Aeronautics and Space Administration; \$1,205,228; 12 years; flame spread experiments conducted on eight Space Shuttle flights.
- 1984 Soot Concentration and Temperature Measurement in Pulverized-Coal Flames, National Science Foundation; \$15,649; 18 months; with Robert E. Peck and Timothy W. Tong as CO-PI's.
- 1983 Flame Spreading in Reduced Gravity, National Aeronautics and Space Administration; \$39,966; 12 months.
- 1982 Flame Spreading in Reduced Gravity, National Aeronautics and Space Administration; \$32,736; 12 months; with Roger Eichhorn as CO-PI.
- Buoyancy Effects on Flame Spreading, National Aeronautics and Space Administration; \$9,953; 12 months; with Roger Eichhorn as CO-PI.
- 1980 Buoyancy Effects on Flame Spreading, National Aeronautics and Space Administration; \$42,905; 14 months; with Roger Eichhorn as CO-PI.
- Behavior of Fuel Nitrogen During Pulverized-Coal Combustion, National Science Foundation; \$98,743; 30 months; with Robert E. Peck as CO-PI.
- 1979 Buoyancy Effects on Flame Spreading, National Aeronautics and Space Administration; \$43,605; 12 months; with Roger Eichhorn as CO-PI.
- Optical Pyrometer Measurement of Particle and Gas Temperature in Coal-Dust Flames, Research Committee and the Institute for Mining and Minerals Research, University of Kentucky; \$1,925; 12 months.
- 1978 Fate of Sulfur in Fuel-Rich Flame Gases, Major Equipment Committee of the Graduate School, University of Kentucky; \$3,720; 12 months.
- Buoyancy Effects on Flames Spreading Down Solid Fuel Beds, National Aeronautics and Space Administration; \$38,846; 12 months; with Roger Eichhorn as CO-PI.

- 1977 Particle Size Reduction and Classification Equipment, National Science Foundation; \$21,200; 18 months; with Robert E. Peck as CO-PI.
- 1976 The Effect of Buoyancy (Gravity) on Flames Spreading Across Solid Beds of Fuel, National Aeronautics and Space Administration; \$31,500; 27 months; with Roger Eichhorn as CO-PI.
- NO and NO<sub>2</sub> Formation in Flat Coal Dust/Oxygen/Diluent Flames, Research Initiation Grant, National Science Foundation; \$20,000; 24 months.
- Effects of Sampling and Measurement Technique on Reported NO<sub>x</sub> Concentration in Flames, Research Committee, University of Kentucky; \$1,050; 12 months.
- 1975 NO<sub>2</sub> and NO Formation from Fuel Bound Nitrogen in Flat Fuel/Oxidizer/ Diluent Flames, Major Equipment Committee of the Graduate School, University of Kentucky; \$4,500; 12 months.

### Publications

1. Wittig, S.L.K., Altenkirch, R.A., Probst, E.P., and Mellor, A.M. (1972). "Influence of Atmospheric Properties on the Self-Absorption in Exploding Wires," Applied Optics II, 765-769.
2. Altenkirch, R.A., Shahed, S.M., and Sawyer, R.F. (1972). "Nitric Oxide Formation Around Droplets Burning at Elevated Pressures," Combustion Science and Technology 5, 147-154.
3. Mellor, A.M., Anderson, R.D., Altenkirch, R.A., and Tuttle, J.H. (1972). "Emissions From and Within an Allison J-33 Combustor," Combustion Science and Technology 6, 169-176.
4. Tuttle, J.H., Altenkirch, R.A., and Mellor, A.M. (1973). "Emissions From and Within an Allison J-33 Combustor II: The Effect of Inlet Air Temperature," Combustion Science and Technology 7, 125-134.
5. Altenkirch, R.A. and Mellor, A.M. (1975). "Emissions and Performance of Continuous Flow Combustors," Fifteenth Symposium (International) on Combustion, The Combustion Institute, Pittsburgh, pp. 1181-1189.
6. Altenkirch, R.A., Eichhorn, R., Hsu, N.N., Brancic, A.B., and Cevallos, N.E. (1977). "Characteristics of Laminar Gas Jet Diffusion Flames Under the Influence of Elevated Gravity," Sixteenth Symposium (International) on Combustion, The Combustion Institute, Pittsburgh, pp. 1165-1174.
7. Altenkirch, R.A., Peck, R.E., and Chen, S.L. (1978). "Fluidized Bed Feeding of Pulverized Coal," Powder Technology 20, 189-196.
8. Altenkirch, R.A., Peck, R.E., and Chen, S.L. (1979). "The Appearance of Nitric Oxide and Cyanide in One-Dimensional Coal Dust/Oxidizer Flames," Combustion Science and Technology 20, 49-58.
9. Altenkirch, R.A., Eichhorn, R., and Shang, P.C. (1980). "Buoyancy Effects on Flames Spreading Down Thermally Thin Fuels," Combustion and Flame 37, 71-83.
10. Vedhanayagam, M., Altenkirch, R.A., and Eichhorn, R. (1980). "A Transformation of the Boundary Layer Equations for Free Convection Past a Vertical Flat Plate with Arbitrary Blowing and Wall Temperature Variations," International Journal of Heat and Mass Transfer 23, 1286-1288.
11. Altenkirch, R.A. and Eichhorn, R. (1981). "Effect of Fluid Drag on Low Reynolds Number



- Discharge of Solids From a Circular Orifice," AICHE Journal 27, 593-598.
12. Altenkirch, R.A., Winchester, D.C., and Eichhorn, R. (1982). "Buoyancy Effects on the Temperature Field in Downward Spreading Flames," Journal of Heat Transfer 104, 560-563.
  13. Altenkirch, R.A., Rezayat, M., Eichhorn, R., and Rizzo, F.J. (1982). "Boundary Integral Equation Method Calculations of Surface Regression Effects in Flame Spreading," Journal of Heat Transfer 104, 734-740.
  14. Altenkirch, R.A., Eichhorn, R., and Rizvi, A.R. (1983). "Correlating Downward Flame Spread Rates for Thick Fuel Beds," Combustion Science and Technology 32, 49-66.
  15. Mackowski, D.W., Altenkirch, R.A., Peck, R.E., and Tong, T.W. (1983). "A Method for Particle and Gas Temperature Measurement in Laboratory-Scale, Pulverized-Coal Flames," Combustion Science and Technology 31, 139-153.
  16. Peck, R.E., Altenkirch, R.A., and Midkiff, K.C. (1983). "Fuel Nitrogen Transformations in One-Dimensional Coal-Dust Flames," Combustion and Flame 55, 331-340.
  17. Altenkirch, R.A., Mackowski, D.W., Peck, R.E., and Tong, T.W. (1984). "Effects of Soot on Pyrometer Measured Temperatures in Pulverized-Coal Flames," Combustion Science and Technology 41, 327-335.
  18. Peck, R.E., Midkiff, K.C., and Altenkirch, R.A. (1985). "The Evolution of Nitrogen from Pulverized, Subbituminous Coal Burnt in a One-Dimensional Flame," Twentieth Symposium (International) on Combustion, The Combustion Institute, Pittsburgh, pp. 1373-1380.
  19. Vedha-Nayagam, M. and Altenkirch, R.A. (1985). "Backward Boundary Layers in Downward Flame Spread," Twentieth Symposium (International) on Combustion, The Combustion Institute, Pittsburgh, pp. 1583-1590.
  20. Vedha-Nayagam, M. and Altenkirch, R.A. (1985). "Gravitational Effects on Flames Spreading over Thick Solid Surfaces," Acta Astronautica 12, 565-572.
  21. Midkiff, K.C., Altenkirch, R.A., and Peck, R.E. (1986). "Stoichiometry and Coal Type Effects on Homogeneous vs. Heterogeneous Combustion in Pulverized-Coal Flames," Combustion and Flame 64, 253-266.
  22. Atogi, O.M., Altenkirch, R.A., and Midkiff, K.C. (1986). "The Distribution of Sulfur in One-Dimensional Pulverized-Coal Flames," Fuel 65, 1663-1669.
  23. Mackowski, D.W., Altenkirch, R.A., and Menguc, M.P. (1987). "Extinction and Absorption Coefficients of Cylindrically-Shaped Soot Particles," Combustion Science and Technology 53, 399-410.
  24. Midkiff, K.C. and Altenkirch, R.A. (1988). "Particle-Size Effects on the Distribution of Fuel Nitrogen in One-Dimensional Coal-Dust Flames," Twenty-First Symposium (International) on Combustion, The Combustion Institute, Pittsburgh, pp. 1189-1198.
  25. Midkiff, K.C. and Altenkirch, R.A. (1988). "Including Heterogeneous Combustion in First-Order and Distributed Activation Energies Models of Coal Nitrogen Release," Fuel 67, 459-463.
  26. Taghavi, K. and Altenkirch, R.A. (1989). "Approximate Method for Transient Conduction in Arbitrarily Shaped Solids with a Volumetric Heat Source," Journal of Thermophysics and Heat Transfer 3, 228-231.

27. Mackowski, D.W., Altenkirch, R.A., and Menguc, M.P. (1989). "A Comparison of Electromagnetic Wave and Radiative Transfer Analyses of a Coal Particle Surrounded by a Soot Cloud," Combustion and Flame 76, 415-420.
28. Altenkirch, R.A. and Vedha-Nayagam, M. (1989). "Opposed-Flow Flame Spread and Extinction in Mixed-Convection Boundary Layers," Twenty-Second Symposium (International) on Combustion, The Combustion Institute, Pittsburgh, pp. 1495-1500.
29. Mackowski, D.W., Altenkirch, R.A., Menguc, M.P., and Saito, K. (1989). "Radiative Properties of Chain-Agglomerated Soot Formed in Hydrocarbon Diffusion Flames," Twenty-Second Symposium (International) on Combustion, The Combustion Institute, Pittsburgh, pp. 1263-1269.
30. Elam, S.K., Tokura, I., Saito, K., and Altenkirch, R.A. (1989). "Thermal Conductivity of Crude Oils," Experimental Thermal and Fluid Science 2, 1-6.
31. Bhattacharjee, S., Altenkirch, R.A., Srikantaiah, N., and Vedha-Nayagam, M. (1990). "A Theoretical Description of Flame Spreading over Solid Combustibles in a Quiescent Environment at Zero Gravity," Combustion Science and Technology 69, 1-15.
32. Mackowski, D.W., Altenkirch, R.A., and Menguc, M.P. (1990). "Internal Absorption Cross Sections in a Stratified Sphere," Applied Optics 29, 1551-1559.
33. Elam, S.K., Altenkirch, R.A., and Saito, K. (1990). "Design of a Radiant 'Strip' Heater for Simulating Liquid Fuel Flows in Flame Spreading," Fire Technology 26, 156-168.
34. Arai, M., Saito, K., and Altenkirch, R.A. (1990). "A Study of Boilover in Liquid Pool Fires Supported on Water, Part I: Effects of a Water Sublayer on Pool Fires," Combustion Science and Technology 71, 25-40.
35. Elam, S.K., Altenkirch, R.A., Saito, K., and Arai, M. (1990). "Cone Heater Ignition Tests of Liquid Fuels," Fire Safety Journal 16, 65-84.
36. Altenkirch, R.A. and Bhattacharjee, S. (1990). "Opposed-Flow Flame Spread with Implications for Combustion at Microgravity," AIAA Progress in Astronautics and Aeronautics 130, 723-740.
37. Arai, M., Saito, K., and Altenkirch, R.A. (1990). "Flame Propagation over a Crude Oil Layer Supported on Water," JPI Sekiyu Gakkaishi 33, 402-408 (in Japanese).
38. Bhattacharjee, S. and Altenkirch, R.A. (1991). "The Effect of Surface Radiation on Flame Spread in a Quiescent, Microgravity Environment," Combustion and Flame 84, 160-169.
39. Bhattacharjee, S. and Altenkirch, R.A. (1991). "Radiation-Controlled, Opposed-Flow Flame Spread in a Microgravity Environment," Twenty-Third Symposium (International) on Combustion, The Combustion Institute, Pittsburgh, pp. 1627-1633.
40. Bhattacharjee, S., Altenkirch, R.A., Olson, S.L., and Sotos, R.G. (1991). "Heat Transfer to a Thin Solid Combustible in Flame Spreading at Microgravity," Journal of Heat Transfer 113, 670-676.
41. West, J., Bhattacharjee, S., and Altenkirch, R.A. (1992). "A Comparison of the Roles Played by Natural and Forced Convection in Opposed-Flow Flame Spreading," Combustion Science and Technology 83, 233-244.
42. Bhattacharjee, S. and Altenkirch, R.A. (1992). "A Comparison of Theoretical and Experimental Results in Flame Spread over Thin Condensed Fuels in a Quiescent, Microgravity Environment,"

Twenty-Fourth Symposium (International) on Combustion, The Combustion Institute, Pittsburgh, pp. 1669-1676.

43. Bhattacharjee, S., Altenkirch, R.A., and Sacksteder, K. (1993). "Implications of Spread Rate and Temperature Measurements in Flame Spread Over a Thin Fuel in a Quiescent, Microgravity, Space-Based Environment," Combustion Science and Technology 91, 225-242.
44. Bullard, D.B., Tang, L., Altenkirch, R.A., and Bhattacharjee, S. (1993). "Unsteady Flame Spread over Solid Fuels in Microgravity," Advances in Space Research 13, 171-184.
45. West, J., Bhattacharjee, S., and Altenkirch, R.A. (1994). "Surface Radiation Effects on Flame Spread over Thermally Thick Fuels in an Opposing Flow," Journal of Heat Transfer 116, 646-651.
46. Bhattacharjee, S., Bhaskaran, K.K., and Altenkirch, R.A. (1994). "Effects of Pyrolysis Kinetics on Opposed-Flow Flame Spread Modeling," Combustion Science and Technology 100, p. 163.
47. Ramachandra, P.A., Altenkirch, R.A., Bhattacharjee, S., Tang, L., Sacksteder, K., and Wolverton, M.K. (1995). "The Behavior of Flames Spreading over Thin Solids in Microgravity," Combustion and Flame 100, pp. 71-84.
48. Bhattacharjee, S., Altenkirch, R.A., and Sacksteder, K. (1996). "The Effect of Ambient Pressure on Flame Spread over Thin Cellulosic Fuel in a Quiescent, Microgravity Environment," Journal of Heat Transfer 118, pp. 181-190.
49. West, J., Tang, L., Altenkirch, R.A., Bhattacharjee, S., Sacksteder, K., and Delichatsios, M.A. (1996). "Quiescent Flame Spread Over Thick Fuels in Microgravity," Twenty-Sixth Symposium (International) on Combustion, The Combustion Institute, Pittsburgh, pp. 1335-1343.
50. Bhattacharjee, S., West, J., and Altenkirch, R.A. (1996). "Determination of the Spread Rate in Opposed-Flow Flame Spread Over Thick Solid Fuels in the Thermal Regime," Twenty-Sixth Symposium (International) on Combustion, The Combustion Institute, Pittsburgh, pp. 1477-1485.
51. West, J., King, M., Bhattacharjee, S., and Altenkirch, R.A. (1997). "Heat Transfer Pathways in Flame Spreading Over Thick Fuels as a Function of the Flame Spread Regime: Microgravity, Thermal, and Kinetic," Combustion Science and Technology 127, pp. 119-140.
52. Altenkirch, R.A., Tang, L., Sacksteder, K., Bhattacharjee, S., and Delichatsios, M.A. (1998). "Inherently Unsteady Flame Spread to Extinction over Thick Fuels in Microgravity," Twenty-Seventh Symposium (International) on Combustion, The Combustion Institute, Pittsburgh, pp. 2515-2524.
53. Wolverton, M.K., Altenkirch, R.A., and Tang, L. (1999). "Implementing Multi-Step Chemical Kinetics Models in Opposed-Flow Flame Spread over Cellulose and a Comparison to Single-Step Chemistry," Combustion and Flame 118, pp. 281-292.
54. Bhattacharjee, S., King, M., Cobb, W., Altenkirch, R.A., and Wakai, K. (2000). "Approximate Two-Color Emission Pyrometry," Journal of Heat Transfer 122, pp. 15-20.
55. Delichatsios, M.A., Altenkirch, R.A., Bundy, M.F., Bhattacharjee, S., and Tang, L. (2000). "Creeping Flame Spread along Fuel Cylinders in Forced and Natural Flows and Microgravity," Twenty-Eighth Symposium (International) on Combustion, The Combustion Institute, Pittsburgh, pp. 2835-2842.
56. Olson, S.L., Hegde, U., Bhattacharjee, S., Deering, J.L., Tang, L., and Altenkirch, R.A. (2004). "Sounding Rocket Experiments Elucidating Diffusive and Radiative Transport Effects on Flame

Spread Over Thermally Thick Solids," Combustion Science and Technology 176/4, pp. 557-584.

### Published Book Reviews

1. Flame and Combustion, J.A. Barnard and J.N. Bradley, Second Edition, Chapman and Hall, 1985, in Combustion and Flame 70, 251.

### Presentations

1. Mellor, A.M., Anderson, R.D., Altenkirch, R.A., and Tuttle, J.H. (1972). "Emissions From and Within an Allison J-33 Combustor," presented by R.A. Altenkirch at the Western States Section/The Combustion Institute Fall Meeting, Monterey, CA, 23-24 October 1972.
2. Tuttle, J.H., Altenkirch, R.A., and Mellor, A.M. (1973). "Emissions From and Within an Allison J-33 Combustor II: The Effect of Inlet Air Temperature," presented by J.H. Tuttle at the Central States Section/The Combustion Institute Meeting, Urbana-Champaign, IL, 1973.
3. Altenkirch, R.A. and Mellor, A.M. (1974). "Emissions and Performance of Continuous Flow Combustors," presented by R.A. Altenkirch at the Fifteenth International Symposium on Combustion, Tokyo, Japan, 25-31 August 1974.
4. Altenkirch, R.A. and Mellor, A.M. (1975). "Predicting Emissions From Pre-vaporizing Combustors Via Continuum Flow Techniques," presented by R.A. Altenkirch at the Western States Section/The Combustion Institute Fall Meeting, Menlo Park, CA, 20-21 October 1975.
5. Altenkirch, R.A., Eichhorn, R., Hsu, N.N., Brancic, A.B., and Cevallos, N.E. (1976). "Characteristics of Laminar Gas Jet Diffusion Flames Under the Influence of Elevated Gravity," presented by R.A. Altenkirch at the Sixteenth International Symposium on Combustion, Cambridge, MA, 15-20 August 1976.
6. Altenkirch, R.A., Eichhorn, R., and Brancic, A.B. (1977). "Buoyancy Induced Extinction of Laminar Gas Jet Diffusion Flames," presented by R.A. Altenkirch at the Central States Section/The Combustion Institute Meeting, Cleveland, OH, 28-29 March 1977.
7. Altenkirch, R.A., Eichhorn, R., and Shang, P.C. (1978). "An Experimental Study of the Effects of Buoyancy on Flames Spreading Down Thermally Thin Paper Samples," presented by R.A. Altenkirch at the Western States Section/The Combustion Institute Fall Meeting, Laguna Beach, CA, 16-17 October 1978.
8. Altenkirch, R.A., Peck, R.E., and Chen, S.L. (1978). "Nitric Oxide Formation in Flat, Coal Dust/Oxygen/Diluent Flames," presented by R.E. Peck at the Eastern Section/The Combustion Institute Meeting, Miami Beach, FL, 29-30 November and 1 December 1978.
9. Altenkirch, R.A. and Eichhorn, R. (1980). "On the Effect of Fluid Flow on the Discharge of Solids From a Circular Orifice: A Minimum Energy Analysis," presented by R.A. Altenkirch at the ASME Polyphase Flow and Transport Technology Symposium, San Francisco, CA, 12-15 August 1980.
10. Altenkirch, R.A., Rizvi, A.R., and Eichhorn, R. (1980). "A Dimensionless Correlation of the Flame Spread Rate Down Thermally Thick Fuels in the Presence of Free Convection," presented by R.A. Altenkirch at the Eastern Section/The Combustion Institute Meeting, Princeton, NJ, 12-14 November 1980.
11. Altenkirch, R.A., Eichhorn, R., and Rizvi, A.R. (1981). "Surface Regression Effects on Flame Spread Correlations," presented by R.A. Altenkirch at the Eastern Section/The Combustion

Institute Meeting, Pittsburgh, PA, 27-29 October 1981.

12. Altenkirch, R.A., Winchester, D.C., and Eichhorn, R. (1982). "Buoyancy Effects on the Temperature Field in Downward Spreading Flames," presented by D.C. Winchester at the AIAA/ASME Joint Fluids, Plasma, Thermophysics, and Heat Transfer Conference, St. Louis, MO, 7-11 June 1982, ASME Paper 82-HT-38.
13. Altenkirch, R.A., Rezayat, M., Eichhorn, R., and Rizzo, F.J. (1982). "Boundary Integral Equation Method Calculations of Surface Regression Effects in Flame Spreading," presented by R.A. Altenkirch at the AIAA/ASME Joint Fluids, Plasma, Thermophysics, and Heat Transfer Conference, St. Louis, MO, 7-11 June 1982, ASME Paper 82-HT-22.
14. Mackowski, D.W., Altenkirch, R.A., Peck, R.E., and Tong, T.W. (1982). "Infrared Pyrometer Measurement of Particle and Gas Temperatures in Pulverized-Coal Flames," presented by D.W. Mackowski at the Western States Section/The Combustion Institute Spring Meeting, Salt Lake City, UT, 5-6 April 1982, WSCI Paper 82-22.
15. Peck, R.E., Midkiff, K.C., and Altenkirch, R.A. (1982). "Fuel Nitrogen Transformations in One-Dimensional Coal-Dust Flames," presented by K.C. Midkiff at the Western States Section/The Combustion Institute Spring Meeting, Salt Lake City, UT, 5-6 April 1982, WSCI Paper 82-8.
16. Altenkirch, R.A., Padgaonkar, A.M., and Eichhorn, R. (1983). "Buoyancy Effects on Flames Spreading Over Thick, Horizontal Fuel Beds," presented by R.A. Altenkirch at the Western States Section/The Combustion Institute Spring Meeting, Pasadena, CA, 11-12 April 1983, WSCI Paper 83-6.
17. Midkiff, K.C., Peck, R.E., and Altenkirch, R.A. (1983). "The Fate of Fuel Nitrogen in One-Dimensional, Subbituminous-Coal-Dust Flames," presented by K.C. Midkiff at the Central States Section/The Combustion Institute Meeting, Lexington KY, 21-22 March 1983, CSS/CI Paper 83-04.
18. Vedha-Nayagam, M. and Altenkirch, R.A. (1983). "The Application of Large Grashof Number Asymptotics to the Prediction of the Gas-Phase Flow Field Induced During Downward Flame Spread," presented by M. Vedha-Nayagam at the Western States Section/The Combustion Institute Spring Meeting, Pasadena, CA, 11-12 April 1983, WSCI Paper 83-3.
19. Altenkirch, R.A., Mackowski, D.W., Peck, R.E., and Tong, T.W. (1983). "Soot Concentration and Temperature Measurement in Pulverized-Coal Flames," presented by D.W. Mackowski at the Eastern Section/The Combustion Institute Meeting, Providence, RI, 8-10 November 1983.
20. Peck, R.E., Midkiff, K.C., and Altenkirch, R.A. (1984). "The Evolution of Nitrogen from Pulverized, Subbituminous Coal Burnt in a One-Dimensional Flame," presented by K.C. Midkiff at the Twentieth International Symposium on Combustion, Ann Arbor, MI, 12-17 August 1984.
21. Vedha-Nayagam, M. and Altenkirch, R.A. (1984). "Backward Boundary Layers in Downward Flame Spread," presented by M. Vedha-Nayagam at the Twentieth International Symposium on Combustion, Ann Arbor, MI, 12-17 August 1984.
22. Vedha-Nayagam, M. and Altenkirch, R.A. (1984). "Gravitational Effects on Flames Spreading over Thick Solid Surfaces," presented by R.A. Altenkirch at the 35th International Astronautical Federation Congress, Lausanne, Switzerland, 8-13 October 1984, IAF Paper 84-154.
23. Altenkirch, R.A. (1984). "Flame Spreading," invited lecture before the National Research Council, Pasadena, CA, 3-4 December 1984.

24. Midkiff, K.C., Altenkirch, R.A., and Peck, R.E. (1985). "Stoichiometry and Coal Type Effects on Homogeneous vs. Heterogeneous Combustion in Pulverized-Coal Flames," presented by K.C. Midkiff at the Central States-Western States Sections/The Combustion Institute Joint Technical Meeting, San Antonio, TX, 22-23 April 1985.
25. Altenkirch, R.A., Short, J.L., Vedha-Nayagam, M., and Padgaonkar, A.M. (1985). "Including Radiation Heat Transfer Effects in Dimensionless Flame Spread Correlations," presented by R.A. Altenkirch at the Central States-Western States Sections/The Combustion Institute Joint Technical Meeting, San Antonio, TX, 22-23 April 1985.
26. Altenkirch, R.A. (1985). "Combustion Studies in Microgravity," invited lecture at the National Science Foundation Workshop on Opportunities for Academic Research in a Low-Gravity Environment, Washington, DC, 10-11 July 1985, in *Progress in Astronautics and Aeronautics* 108, 225-230 (1986).
27. Altenkirch, R.A. (1985). "Flame Spread under Microgravity Conditions," Gordon Research Conference on Gravitational Effects in Materials and Separation Processes and Living Systems, New London, NH, 19-23 August 1985.
28. Altenkirch, R.A. (1985). "Gravitational Effects on Flames," University of Kentucky/IBM Distinguished Lecture Series, Lexington, KY, 11 September 1985.
29. Mackowski, D.W., Altenkirch, R.A., and Menguc, M.P. (1985). "Multiple-Wavelength Pyrometer Measurement of Particle Size in Pulverized-Coal Flames," presented by D.W. Mackowski at the Eastern Section/The Combustion Institute Meeting, Philadelphia, PA, 4-6 November 1985.
30. Midkiff, K.C., Altenkirch, R.A., and Li, K. (1985). "Particle-Size Effects on the Distribution of Fuel Nitrogen in One-Dimensional Coal-Dust Flames," presented by K.C. Midkiff at the Eastern Section/The Combustion Institute Meeting, Philadelphia, PA, 4-6 November 1985.
31. Altenkirch, R.A. (1986). "The Use of a Low-Gravity Environment in Combustion Research," invited paper at the Central States Section/The Combustion Institute Technical Meeting, Cleveland, OH, 5-6 May 1986.
32. Vedha-Nayagam, M. and Altenkirch, R.A. (1986). "The Shape of Low-Gravity Flames Spreading Across Solid Combustible Surfaces," presented by M. Vedha-Nayagam at the Central States Section/The Combustion Institute Technical Meeting, Cleveland, OH, 5-6 May 1986, Paper No. 3-D2.
33. Atogi, O.M., Altenkirch, R.A., and Midkiff, K.C. (1986). "The Distribution of Sulfur in One-Dimensional Pulverized-Coal Flames," presented by O.M. Atogi at the Central States Section/The Combustion Institute Technical Meeting, Cleveland, OH, 5-6 May 1986, Paper No. 1-B2.
34. Midkiff, K.C. and Altenkirch, R.A. (1986). "Particle-Size Effects on the Distribution of Fuel Nitrogen in One-Dimensional Coal-Dust Flames," presented by R.A. Altenkirch at the Twenty-First International Symposium on Combustion, Munich, FRG, 3-8 August 1986.
35. Vedha-Nayagam, M., Saito, K., and Altenkirch, R.A. (1986). "Edge Effects in Flame Spreading Down Thermally Thin Solid Fuels," presented by M. Vedha-Nayagam at the Eastern Section/The Combustion Institute Meeting, San Juan, Puerto Rico, 15-17 December 1986.
36. Vedha-Nayagam, M. and Altenkirch, R.A. (1987). "Flame Extinction during Downward Flame Spread into an Opposing Forced Flow of Oxidizer," presented by M. Vedha-Nayagam at the

Central States Section/The Combustion Institute Technical Meeting, Argonne, IL, 11-12 May 1987.

37. Mackowski, D.W., Altenkirch, R.A., Saito, K., and Menguc, M.P. (1987). "Optical Determination of Soot Agglomeration in Gas Diffusion Flames," presented by D.W. Mackowski at the Central States Section/The Combustion Institute Technical Meeting, Argonne, IL, 11-12 May 1987.
38. Midkiff, K.C. and Altenkirch, R.A. (1987). "Including Heterogeneous Combustion in First-Order and Distributed-Activation-Energies Models of Coal-Nitrogen Release," presented by K.C. Midkiff at the Central States Section/The Combustion Institute Technical Meeting, Argonne, IL, 11-12 May 1987.
39. Mackowski, D.W., Altenkirch, R.A., and Menguc, M.P. (1987). "Extinction and Absorption Coefficients of Cylindrically-Shaped Soot Particles," presented by D.W. Mackowski at the Central States Section/The Combustion Institute Technical Meeting, Argonne, IL, 11-12 May 1987.
40. Tokura, I., Saito, K., Altenkirch, R.A., and Evans, D.D. (1987). "A Study of Crude Oil Combustion: Thermal Conductivity of the Condensed Phase," presented by I. Tokura in a poster session at the Central States Section/The Combustion Institute Technical Meeting, Argonne, IL, 11-12 May 1987.
41. Taghavi, K. and Altenkirch, R.A. (1987). "Approximate Transient Behavior of Solids with an Internal Heat Source," presented by K. Taghavi at the ASME National Heat Transfer Conference, Pittsburgh, PA, 9-12 August 1987, in ASME publication HTD-Vol. 69.
42. Altenkirch, R.A. (1987). "Pyrolysis and Combustion of Pulverized Coal," invited lecture at the Eastern Section/The Combustion Institute Meeting, Gaithersburg, MD, 2-6 November 1987.
43. Elam, S.K., Tokura, I., Saito, K., and Altenkirch, R.A. (1988). "Prediction of Thermal Conductivity of Crude Oil for Use in Oil-Slick Combustion Modelling," presented by S.K. Elam at the Central States Section/The Combustion Institute Technical Meeting, Indianapolis, IN, 2-3 May 1988.
44. Arai, M., Saito, K., Altenkirch, R.A., and Evans, D. (1988). "A Study of the Boilover Phenomenon for Liquid Fuel Supported on Water," presented by M. Arai at the Central States Section/The Combustion Institute Technical Meeting, Indianapolis, IN, 2-3 May 1988.
45. Mackowski, D.W., Altenkirch, R.A., and Menguc, M.P. (1988). "Electromagnetic Wave Analysis of a Coal Particle Surrounded by a Soot Cloud," presented by D.W. Mackowski at the Central States Section/The Combustion Institute Technical Meeting, Indianapolis, IN, 2-3 May 1988.
46. Mackowski, D.W., Altenkirch, R.A., and Saito, K. (1988). "Concave Hydrocarbon-Air Diffusion Flames on a Coflow Burner," presented by D.W. Mackowski at the Central States Section/The Combustion Institute Technical Meeting, Indianapolis, IN, 2-3 May 1988.
47. Jolly, S., Menguc, M.P., Saito, K., and Altenkirch, R.A. (1988). "Scaling Flashover Phenomena in Compartment Fires," presented by K. Saito at the International Symposium on Scale Modeling, Tokyo, Japan, 18-22 July 1988.
48. Chakravarty, S., Menguc, M.P., Mackowski, D., and Altenkirch, R.A. (1988). "Application of Two Inversion Schemes to Determine the Absorption Coefficient Distribution in Flames," presented by M.P. Menguc at the ASME National Heat Transfer Conference, Houston, TX, 24-27 July 1988.
49. Altenkirch, R.A. and Vedha-Nayagam, M. (1988). "Opposed-Flow Flame Spread and Extinction

in Mixed-Convection Boundary Layers," presented by M. Vedha-Nayagam at the Twenty-Second International Symposium on Combustion, Seattle, WA, 14-19 August 1988.

50. Mackowski, D.W., Altenkirch, R.A., Menguc, M.P., and Saito, K. (1988). "Radiative Properties of Chain-Agglomerated Soot Formed in Hydrocarbon Diffusion Flames," presented by D.W. Mackowski at the Twenty-Second International Symposium on Combustion, Seattle, WA, 14-19 August 1988.
51. Arai, M., Saito, K., and Altenkirch, R.A. (1988). "Experimental Study of the Boilover Phenomenon for Liquid Fuels on a Water Sublayer," presented by M. Arai in a poster session at the Twenty-Second International Symposium on Combustion, Seattle, WA 14-19 August 1988.
52. Elam, S.K., Arai, M., Saito, K., and Altenkirch, R.A. (1988). "Cone Heater Ignition Tests of Crude Oils," presented by K. Saito at the Eastern Section/The Combustion Institute Meeting, Clearwater Beach, FL, 5-7 December 1988.
53. Bhattacharjee, S., Altenkirch, R.A., Olson, S.L., and Sotos, R.G. (1988). "Heat Transfer to a Thin Solid Combustible in Flame Spreading at Microgravity," presented by S. Bhattacharjee at the Eastern Section/The Combustion Institute Meeting, Clearwater Beach, FL, 5-7 December 1988.
54. Srikantaiah, N., Altenkirch, R.A., Bhattacharjee, S., and Vedha-Nayagam, M. (1988). "A Theoretical Description of Flame Spreading over Solid Combustibles at Zero-Gravity," presented by S. Bhattacharjee at the Eastern Section/The Combustion Institute Meeting, Clearwater Beach, FL, 5-7 December 1988.
55. Vento, D., Zavesky, R., Sacksteder, K., and Altenkirch, R. (1989). "The Solid Surface Combustion Space Shuttle Experiment Hardware Description and Ground-Based Test Results," presented by D. Vento at the 27th Aerospace Sciences Meeting, Reno, NV, 9-12 January 1989, AIAA Paper 89-0503 (also NASA TM 101963).
56. Altenkirch, R.A. (1989). "Flame Spread over Solid Fuels," invited presentation at the International Microgravity Combustion Workshop, NASA-Lewis Research Center, Cleveland, OH, 25-26 January 1989.
57. Bhattacharjee, S. and Altenkirch, R.A. (1989). "The Effect of Surface Radiation on Flame Spread in a Quiescent, Microgravity Environment," presented by S. Bhattacharjee at the Central States Section/The Combustion Institute Meeting, Dearborn, MI, 30 April-3 May 1989.
58. Arai, M., Saito, K., and Altenkirch, R.A. (1989). "Flame Spread on Crude Oil Supported on Water," presented by R.A. Altenkirch at the Central States Section/The Combustion Institute Meeting, Dearborn, MI, 30 April-3 May 1989 (also in Heat Transfer News: Japanese Southern Section Heat Transfer Conference, 16 December 1988).
59. Bhattacharjee, S. and Altenkirch, R.A. (1989). "Radiative Effects in Opposed-Flow Flame Spread over Thin Fuels," presented by S. Bhattacharjee at the Eastern Section/The Combustion Institute Meeting, Albany, NY, 30-31 October and 1 November 1989.
60. West, J., Bhattacharjee, S., and Altenkirch, R.A. (1990). "Buoyancy in Flame Spreading: A Comparison of the Role Played by Natural and Forced Convection," presented by J. West at the Central States Section/The Combustion Institute Meeting, Cincinnati, OH, 20-22 May 1990.
61. Bhattacharjee, S. and Altenkirch, R.A. (1990). "Radiation-Controlled, Opposed-Flow Flame Spread in a Microgravity Environment," presented by S. Bhattacharjee at the Twenty-Third International Symposium on Combustion, University of Orleans, France, 22-27 July 1990.



62. West, J., Bhattacharjee, S., and Altenkirch, R.A. (1990). "Flame Temperature and Radiative Effects on Flame Spread over Thermally Thick Fuels," presented by J. West at the Eastern Section/The Combustion Institute Meeting, Orlando, FL, 3-5 December 1990.
63. Bhattacharjee, S. and Altenkirch, R.A. (1991). "Three-Dimensional Radiative Effects in Opposed-Flow Flame Spread Modeling," presented by S. Bhattacharjee at the Central States Section/The Combustion Institute Meeting, Nashville, TN, 21-23 April 1991.
64. Altenkirch, R.A., Bhattacharjee, S., Olson, S.L., and West, J. (1991). "Opposed Flow Flame Spread in Normal, Enhanced and Reduced Gravity," presented by R.A. Altenkirch at the IKI/AIAA Microgravity Science Symposium, Moscow, USSR, 12-21 May 1991.
65. Altenkirch, R.A. (1991). "Fundamentals of Low-Gravity Opposed-Flow Flame Spread over Solid Combustibles," Workshop on Spacecraft Fire Safety, University of California, Los Angeles, 31 October-1 November 1991.
66. Bhattacharjee, S. and Altenkirch, R.A. (1992). "A Comparison of Theoretical and Experimental Results in Flame Spread over Thin Condensed Fuels in a Quiescent, Microgravity Environment," presented by S. Bhattacharjee at the Twenty-Fourth International Symposium on Combustion, The University of Sydney, Sydney, Australia, 5-10 July 1992.
67. Bhattacharjee, S., Bhaskaran, K.K., and Altenkirch, R.A. (1992). "Effects of Pyrolysis Kinetics on Opposed-Flow Flame Spread Modeling," presented by S. Bhattacharjee at the ASME/AIChE National Heat Transfer Conference, HTD-Vol. 199, San Diego, CA, 8-12 August 1992.
68. West, J., Bhattacharjee, S., and Altenkirch, R.A. (1992). "Surface Radiative Effects on Flame Spread over Thermally Thick Fuels in an Opposing Flow," presented by J. West at the ASME/AIChE National Heat Transfer Conference, HTD-Vol. 199, San Diego, CA, 8-12 August 1992.
69. Altenkirch, R.A., Tang, L., Bullard, D.B., and Bhattacharjee, S. (1992). "Unsteady Flame Spread over Solid Fuels in Microgravity," presented by R.A. Altenkirch at the World Space Congress, Washington, DC, 5 September 1992.
70. Altenkirch, R.A., Bhattacharjee, S., Olson, S.L., and Sacksteder, K. (1992). "Opposed-Flow Flame Spreading in Reduced Gravity," presented by R.A. Altenkirch at the Second International Microgravity Combustion Workshop, Cleveland, OH, 15-17 September 1992.
71. West, J., Bhattacharjee, S., and Altenkirch, R.A. (1992). "Investigation of Controlling Parameters in Transition between Thermally Thin and Thermally Thick Flame Spread over Solid Fuels in an Opposing Flow," presented by J. West at the Western States Section/The Combustion Institute Meeting, Berkeley, CA, 12 and 13 October 1992, WSSCI Paper No. 92-106.
72. Bhattacharjee, S., Seaton, D., and Altenkirch, R.A. (1992). "The Role of Kinetic, Transport, and Thermodynamic Properties on Flame Spread over a Thin Solid Fuel in an Opposed Flow Environment," presented by D. Seaton at the Western States Section/The Combustion Institute Meeting, Berkeley, CA, 12 and 13 October 1992, WSSCI Paper No. 92-107.
73. Tang, L., Altenkirch, R.A., Ramachandra, P., Wolverson, M.K., Bhattacharjee, S., and Sacksteder, K. (1993). "Unsteady Flame Spread Over Thin Solid Fuels in Quiescent Environments," presented by P. Ramachandra at the Central States and Eastern Sections: The Combustion Institute Joint Technical Meeting, New Orleans, LA, 15-17 March 1993, Paper No. 117.
74. Bhattacharjee, S., Charles, T.L., and Altenkirch, R.A. (1993). "Modeling Gas-Phase Radiation from Laminar Flame Spreading over Solids," presented by R.A. Altenkirch at the ASME Winter

Annual Meeting, 93-WA/HT-19, New Orleans, LA, 28 November-3 December 1993.

75. Bhattacharjee, S., Altenkirch, R.A., and Sacksteder, K. (1993). "The Effect of Ambient Pressure on Flame Spread Over a Thin Cellulosic Fuel in a Quiescent, Microgravity Environment: Theory and Experiment," presented by R.A. Altenkirch at the ASME Winter Annual Meeting, 93-WA/HT-20, New Orleans, LA, 28 November-3 December 1993.
76. Altenkirch, R.A., Sacksteder, K., Bhattacharjee, S., Ramachandra, P.A., Tang, L., and Wolverton, M.K. (1993). "The Solid Surface Combustion Experiment Aboard the USML-1 Mission," presented by R.A. Altenkirch at the USML-1 Mission Science Review, Huntsville, AL, September 1993.
77. West, J., Bhattacharjee, S., Rameriez, B., and Altenkirch, R.A. (1994). "Low Reynolds Number Flow Near the Leading Edge of a Burning and Non-Burning Plate in a Microgravity Environment," presented at the 1994 AIAA/ASME Thermophysics and Heat Transfer Conference, Colorado Springs, CO, 20-23 June 1994.
78. Ramachandra, P.A., Altenkirch, R.A., Tang, L., Sacksteder, K., Wolverton, M.K., and Bhattacharjee, S. (1994). "The Behavior of Flames Spreading over Thin Solids in Microgravity," presented by R.A. Altenkirch at the Twenty-Fifth International Symposium on Combustion, Irvine, CA, 31 July-5 August 1994.
79. Bundy, M., West, J., Thomas, P.C., Bhattacharjee, S., Tang, L., Altenkirch, R.A., and Sacksteder, K. (1995). "Solid Surface Combustion Experiment Flame Spread in a Quiescent, Microgravity Environment Implications of Spread Rate and Flame Structure," presented by R.A. Altenkirch at the Third International Microgravity Combustion Conference, Cleveland, OH, 11-13 April 1995.
80. West, J., Thomas, P., Chao, R., Bhattacharjee, S., Tang, L., Altenkirch, R.A., and Olson, S.L. (1995). "Low Velocity Opposed-Flow Flame Spread in a Transport-Controlled Environment DARTFire," presented by R.A. Altenkirch at the Third International Microgravity Combustion Conference, Cleveland, OH, 11-13 April 1995.
81. West, J., Chao, R., Bhattacharjee, S., Tang, L., and Altenkirch, R.A. (1995). "Evaluation of the Quasi-Steady Hypothesis for Opposed-Flow Flame Spread over Thick Fuels: A Comparison of Unsteady and Steady-State Modeling," Central States/Western States/Mexican National Sections of the Combustion Institute and American Flame Research Committee Meeting, San Antonio, TX, 23-26 April 1995.
82. Bhattacharjee, S., West, J., and Altenkirch, R.A. (1995). "Hydrodynamic Effects in Laminar Opposed-Flow Flame Spread Over a Thick Fuel in the Thermal Regime: Extension of a Simplified Theory," Central States/Western States/Mexican National Sections of the Combustion Institute and American Flame Research Committee Meeting, San Antonio, TX, 23-26 April 1995.
83. West, J., Bhattacharjee, S., and Altenkirch, R.A. (1995). "Mechanisms for Forward Heat Transfer in Flame Spread Over Thermally Thick Solid Fuels in an Opposing Flow," Western States Section of the Combustion Institute Meeting, Mountain View, CA, 29-31 October 1995.
84. Bhattacharjee, S., West, J., Hamilton, M. King, M., and Altenkirch, R.A. (1996). "A Criterion for Transition between Thermally Thin and Thick Regimes for Opposed-Flow Flame Spread," Central States Section of the Combustion Institute Meeting, St. Louis, MO, 5-7 May 1996.
85. West, J., Tang, L., Altenkirch, R.A., Bhattacharjee, S., Sacksteder, K., and Delichatsios, M.A. (1996). "Quiescent Flame Spread Over Thick Fuels in Microgravity," Twenty-Sixth International Symposium on Combustion, presented by R.A. Altenkirch, 28 July-2 August 1996 Naples, Italy.

86. Bhattacharjee, S., West, J., and Altenkirch, R.A. (1996). "Determination of the Spread Rate in Opposed-Flow Flame Spread Over Thick Solid Fuels in the Thermal Regime," Twenty-Sixth International Symposium on Combustion, presented by S. Bhattacharjee, 28 July-2 August 1996, Naples, Italy.
87. Altenkirch, R.A. (1997). "Fundamentals of Flame Spreading in Low Velocity Flows," Invited Speech by R.A. Altenkirch at the Central States Section of The Combustion Institute Meeting, Point Clear, AL, 27-29 April, 1997.
88. Bhattacharjee, S., Worley, R., Altenkirch, R.A., Bundy, M., Tang, L., Delichatsios, M.A., and Sacksteder, K. (1997). "Opposed-Flow Flame Spread over Cylindrical Fuels," presented by M. Bundy at the Central States Section of The Combustion Institute Meeting, Point Clear, AL, 27-29 April, 1997.
89. Wolverton, M.K., Altenkirch, R.A., and Tang, L. (1997). "A Comparison of Single and Multi-Step Chemical Kinetics Models in Opposed-Flow Flame Spread over Cellulosic Fuels," presented by M.K. Wolverton at the Central States Section of The Combustion Institute Meeting, Point Clear, AL, 27-29 April, 1997.
90. Bhattacharjee, S., Altenkirch, R.A., Worley, R., Tang, L., Bundy, M., Sacksteder, K., and Delichatsios, M.A. (1997). "Reflight of the Solid Surface Combustion Experiment: Opposed-Flow Flame Spread over Cylindrical Fuels, presented by S. Bhattacharjee at the 4<sup>th</sup> International Microgravity Combustion Workshop, Cleveland, OH, 19-21 May 1997.
91. Altenkirch, R.A., Bhattacharjee, S., West, J., Tang, L., Sacksteder, K., and Delichatsios, M.A. (1997). "Solid Surface Combustion Experiment: Thick Fuel Results," presented by R.A. Altenkirch at the 4<sup>th</sup> International Microgravity Combustion Workshop, Cleveland, OH, 19-21 May 1997.
92. Olson, S.L., Altenkirch, R.A., Bhattacharjee, S., Tang, L., and Hegde, U. (1997). "Diffusive and Radiative Transport in Fires Experiment: DARTFire," presented by S.L. Olson at the 4<sup>th</sup> International Microgravity Combustion Workshop, Cleveland, OH, 19-21 May 1997.
93. West, J., Bhattacharjee, S., Seshadri, K., and Altenkirch, R.A. (1997). "Further Application of Damkohler Number Concepts in Opposed-Flow Flame Spread over Solid Fuels," 2<sup>nd</sup> International Scale Modelling Symposium, submitted, Lexington, KY, June 1997.
94. Altenkirch, R.A. (1997). "Flame Spreading over Solids in Microgravity," presented by R.A. Altenkirch at the Gordon Research Conference, Henniker, NH, 30 June 1997.
95. Altenkirch, R.A., Tang, L., Sacksteder, K., Bhattacharjee, S., and Delichatsios, M.A. (1998). "Inherently Unsteady Flame Spread to Extinction over Thick Fuels in Microgravity," presented by R.A. Altenkirch at the Twenty-Seventh International Symposium on Combustion, Boulder, CO, 2-7 August 1998.
96. Delichatsios, M.A., Altenkirch, R.A., Bundy, M.F., Bhattacharjee, S., and Tang, L. (2000). "Creeping Flame Spread along Fuel Cylinders in Forced and Natural Flows and Microgravity," presented by R.A. Altenkirch at the Twenty-Eighth International Symposium on Combustion, Edinburgh, Scotland, 30 July-4 August 2000.

## Reports

1. Mellor, A.M., Anderson, R.D., Altenkirch, R.A., and Tuttle, J.H. (1972). "Emissions From and Within an Allison J-33 Combustor," Report No. CL-72-1, The Combustion Laboratory, Purdue University, West Lafayette, Indiana.

2. Altenkirch, R.A. and Mellor, A.M. (1972). "Preliminary Study on Emissions and Performance of Automotive Gas Turbine Liners," Report No. CL-72-3, The Combustion Laboratory, Purdue University, West Lafayette, Indiana.
3. Tuttle, J.H., Altenkirch, R.A., and Mellor, A.M. (1973). "Emissions From and Within an Allison J-33 Combustor II: The Effect of Inlet Air Temperature," Report No. PURDU-CL-73-01, The Combustion Laboratory, Purdue University, West Lafayette, Indiana.
4. Altenkirch, R.A. and Mellor, A.M. (1973). "Emissions and Performance of Gas Turbine Liners I: Stability," Report No. PURDU-CL-73-05, The Combustion Laboratory, Purdue University, West Lafayette, Indiana.
5. Altenkirch, R.A. and Mellor, A.M. (1975). "Continuum Flow Predictions of Measured Species Concentrations within a Pre-vaporizing Combustor," Report No. PURDU-CL-75-01, The Combustion Laboratory, Purdue University, West Lafayette, Indiana.
6. Altenkirch, R.A., Peck R.E., and Chen, S.L. (1978). "NO and NO<sub>2</sub> Formation in Flat Coal Dust/Oxygen/Diluent Flames," Report No. UKY TR108-78-ME16, College of Engineering, University of Kentucky, Lexington, Kentucky; NSF Report on Grant No. ENG76-09466.
7. Shang, P.C., Altenkirch, R.A., and Eichhorn, R. (1978). "An Experimental Study of the Influence of Elevated Buoyancy Levels on Flame Spread Rate Over Thermally Thin Cellulosic Materials," Report No. UKY TR109-78-ME17, College of Engineering, University of Kentucky, Lexington, Kentucky.
8. Peck, R.E. and Altenkirch, R.A. (1979). "Particle Size Reduction and Classification Equipment," NSF Report on Grant No. ENG77-17288.
9. Altenkirch, R.A. (1982). "High Altitude Operation of the Sure Fire Torch," submitted to Ignitor Products, Nicholasville, Kentucky.
10. Berlad, A.L. (ed.), Altenkirch, R.A., DeWitt, K., Hoffman, J.A., Levine, R.S., Ostrach, S., Reuss, D.L., Saville, D.A., Strehlow, R.A., Summerfield, M., and Williams, F.A. (1982). "Definition of Experiment Requirements for a Spacelab Combustion Facility," Universities Space Research Association Requirements Working Group Report.
11. Midkiff, K.C., Mackowski, D.W., Peck, R.E., and Altenkirch, R.A. (1983). "Flat-Flame Burner Studies of Pulverized-Coal Combustion, Part I. Evolution of Fuel Nitrogen, Part II. Infrared Pyrometer Measurement of Temperatures," NSF Report on Grant No. CPE-7926312.
12. Quintiere, J.G., Alpert, R.L., and Altenkirch, R.A. (eds.) (1983). "Fire Dynamics and Heat Transfer," ASME HTD-Vol. 25.
13. Altenkirch, R.A. (1984). "Solid Surface Combustion at Reduced Gravity," Science Requirements Document for a Space Shuttle Experiment, Contract NAS3-23901, NASA-Lewis Research Center, Cleveland, Ohio.
14. Vedha-Nayagam, M. and Altenkirch, R.A. (1985). "Gravitational Effects in Flame Spreading," NASA Report on Grants NAG 3-258 and NAG 3-114.
15. Altenkirch, R.A. (1986). "Flame Spreading," in Microgravity Science and Applications Report on a Workshop, Board on Physics and Astronomy, National Research Council.
16. Altenkirch, R.A. and Mackowski, D.W. (1987). "Research Equipment: Soot Concentration and

Temperature Measurement in Pulverized-Coal Flames," NSF Report on Grant No. MEA-8405767.

17. Srikantaiah, N., Altenkirch, R.A., Vedha-Nayagam, M., and Bhattacharjee, S. (1988). "Flame Spread into a Quiescent Oxidizing Medium under Microgravity," NASA Report on Contract NAS3-23901.
18. Altenkirch, R.A., Olson, S.L., and Bhattacharjee, S. (1994). "Diffusive and Radiative Transport in Fires Experiment," Science Requirements Document, Grant NCC3-221, NASA-Lewis Research Center, Cleveland, Ohio.
19. National Research Council Committee on Microgravity Research (1996). "Archiving Microgravity Flight Data and Samples," National Academy of Sciences Contract NASW 4627 with the National Aeronautics and Space Administration, National Academy Press, Washington, DC.
20. Altenkirch, R.A., Bhattacharjee, S., Delichatsios, M.A. (1996). "A Reflight of the Solid Surface Combustion Experiment with Emphasis on Flame Radiation near Extinction," Report on NASA Grant NCC3-354 for the period January 1995 to January 1996.
21. National Research Council Committee on Microgravity Research (1997). "An Initial Review of Microgravity Research in Support of Human Exploration and Development of Space," National Academy of Sciences Contract NASW 96013 with the National Aeronautics and Space Administration, National Academy Press, Washington, DC.
22. National Research Council Committee on Microgravity Research (2000). "Microgravity Research in Support of Technologies for the Human Exploration and Development of Space and Planetary Bodies," National Academy Press, ISBN 0-309-06491-0.
23. National Research Council Board on Assessment of NIST Programs (2000). "An Assessment of the National Institute of Standards and Technology Measurement and Standards Laboratories," Panel Member for Chapter & Building and Fire Research Laboratory, National Academy Press, Washington, D.C.
24. Altenkirch, R.A., Bhattacharjee, S., Deering, J.L., Olson, S.L., and Tang, L. (2001). "Diffusive and Radiative Transport in Fires, Grant NCC3-221, Final Report, NASA Glenn Research Center.
25. National Research Council Board on Assessment of NIST Programs (2001). "An Assessment of the National Institute of Standards and Technology Measurement and Standards Laboratories," Panel Member for Chapter & Building and Fire Research Laboratory, National Academy Press, Washington, D.C.