



Combustion

Science & Engineering, Inc.

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DOUGLAS J. CARPENTER, MScFPE, CFEL, PE

EDUCATION:

M.S., Fire Protection Engineering, Worcester Polytechnic Institute, Worcester, MA, 1996.

B.S., Mechanical Engineering, University of Vermont, Burlington, VT, 1992.

A.S., Mechanical Engineering, Vermont Technical College, Randolph Center, VT, 1984.

THESIS:

Carpenter, D. J., “An Investigation into the Validity of Modeling Post-Flashover Fires and Flame Extension from Openings with the Fire Field Model JASMINE”, Worcester Polytechnic Institute, August 1996.

PROFESSIONAL EXPERIENCE:

Research Assistant Professor, Department of Fire Protection Engineering, Worcester Polytechnic Institute, Worcester, MA, 2009 to present. Appointment for research collaboration with faculty in the area of fire protection engineering.

Vice President and Principal Engineer, Combustion Science & Engineering, Inc., Columbia, MD, 1998 to present. Responsibilities include fire investigations, fire reconstruction analyses, and performing fire hazard analyses utilizing computer fire modeling including both zone models and Computational Fluid Dynamics (CFD). Applied quantitative and performance-based fire hazard analysis skills to a wide range of projects including nuclear production reactors and facilities at DOE’s Savannah River Site, building atria, manufacturing operations, transportation vehicles, airports, as well as United States research facilities and airport operations in Antarctica. Developed a flame-spread model for use in a CFD model of burning vehicles. Developed and taught classes and seminars in fire investigation, performance-based fire safety design, and computer fire modeling for such organizations as the Society of Fire Protection Engineers (SFPE) and the International Council of Building Officials (ICBO). Panel Member for Nuclear Regulatory Commission’s PIRT (Phenomenon Identification Ranking Table) review process associated with computer fire modeling in the commercial nuclear environment.

Staff Engineer, Hughes Associates, Inc., Baltimore, MD, 1996 to 1998.

Conducted in-house cone calorimeter tests for code equivalency evaluations and fire litigation support. Performed fire hazard analysis for military aircraft hush houses to

determine technical requirements for alternative suppression system to existing Halon 1301 systems. Performed a review of fire hazards and fire suppression system options for the Halifax Class frigates of the Canadian Navy. Developed a computer program for the military evaluating alternative systems for existing Halon 1301 systems. Performed a comprehensive evaluation of the military's current Halon 1211 replacement program. Conducted on-scene fire investigations and computer fire modeling in support of fire litigation work. Conducted experiments that mapped the heat flux of Halogen Torchiers Lamps for development of a model to determine ignition potential of adjacent combustibles.

Fire Protection Engineer, Office of Polar Programs, National Science Foundation, Arlington, VA, 1995-1996. Assisted engineers in examining fire protection engineering issues associated with Amundsen-Scott South Pole, McMurdo, and Palmer Stations in Antarctica. Projects emphasized equivalent levels of protection for fire hazards and life safety using a systems and performance-based engineering approach in this unique and challenging environment. Actively involved with the fire protection specification and design for the proposed new research station at the South Pole as part of the South Pole Redevelopment Project (SPRP). Conducted a fire risk assessment of buildings in McMurdo Station, which included computer fire modeling. Conducted on-site visits of McMurdo and Amundsen-Scott South Pole Station.

Fire Protection Engineer, ABASCO Services, Inc., Augusta, GA, 1993.

Six-month graduate internship. Responsible for developing a framework for an alternative methodology to the average combustible loading method for fire barrier analysis. Reviewed and provided written critique for proposed on-site work connected with fire protection at the Department of Energy's Savannah River Site.

Fire Protection Engineer, MBS Fire Technology, Inc., Worcester, MA, 1993.

Six-month graduate internship. Part of a team responsible for writing a revision of a fire hazard analysis for a nuclear production reactor using a performance-based approach. Provided recommendations for alternative methods to using Halon 1301 for fire protection within the reactor environment. Reviewed and provided written critique for proposed on-site work connected with fire protection at the Department of Energy's Savannah River Site.

PROFESSIONAL REGISTRATION AND CERTIFICATION:

Certified Fire and Explosion Investigator, National Association of Fire Investigators, 2005.
Professional Engineer (P.E.), State of Maryland, License No. 32633.

HONORS:

Antarctic Service Medal of the United States of America, May, 1999.
Salamander Honorary Fire Protection Engineering Society May 1995.
Campus Safety Association Scholarship Award, May 1995.
Percy Bugbee Fire Protection Engineering Scholarship, May 1995.

M&M Protection Consultants Scholarship, May 1994.
Deans List at University of Vermont: Fall 1988, 1991, Spring 1992.

PROFESSIONAL MEMBERSHIP:

Member, International Association for Fire Safety Science (IAFSS)
Member, National Fire Protection Association (NFPA)
Member, Society of Fire Protection Engineers (SFPE)
Member, National Association of Fire Investigators (NAFI)
Member, International Association of Arson Investigators (IAAI)
Member, DC/MD Chapter, International Association of Arson Investigators
Member, American Society of Mechanical Engineers (ASME)
Member, American Society of Testing and Materials (ASTM)
Member, Building Officials Code Administration (BOCA)
Member, NFPA 92B Task Group, 1998
Member, SFPE Task Group on Computer Model Evaluation, 1998-present.
Member, SFPE Educational Committee, 1999 – present.
Member, IAAI Fire & Arson Investigator Editorial Review Board, 2006 – present.
Alternate Member, NFPA 921, *Guide for Fire and Explosion Investigations*, 2000 – present.
Associate Member, Engineering Sciences, American Academy of Forensic Sciences (AAFS), 2006
Member, Arson Review Committee (ARC), The Innocence Project, NYC, 2005 – present.

PROFESSIONAL BOARD MEMBERSHIP:

Member, Board of Advisors, Fire Protection Engineering Department, WPI, 2009 – present.
Member, IAAI Fire & Arson Investigator Editorial Review Board, 2006 – present.

CONTINUING EDUCATION:

FPE 580L “Case Studies in Fire Safety Engineering Science”, Worcester Polytechnic Institute, Advanced Distance Learning Network (ADLN), 16-week course, Instructor: Dr. Patrick J. Pagni, University of California at Berkley, Fall, 2000.

“**Smoke Management for Atria and Other Large Spaces**”, one-day course sponsored by the Society of Fire Protection Engineers (SFPE), and American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE), Baltimore, MD, October 6, 2000.

INSTRUCTOR:

“**Advanced Fire Dynamics**”, Adjunct Lecturer for graduate level distance learning course for the Department of Fire Protection Engineering at the University of Maryland, December 2004 – present.

“**Introduction to Fire Modeling**”, two-day course sponsored by the Society of Fire Protection Engineers (SFPE), **Atlanta, GA**, November 12 –13, 1998; **Baltimore, MD** May 13 –14, 1999, **Baltimore, MD** October 2 – 3, 2000, **Idaho Falls, Idaho**, May 7 - 8, 2002.

“**Introduction to Fire Modeling**”, one-day course sponsored by the International Fire Code Institute (IFCI), the International Conference of Building Officials (ICBO), and the Society of Fire Protection Engineers (SFPE), **St. Paul, MI**, November 17 & 19, 1998; **Tacoma, WA**, January 28, 1999.

“**Engineering Design Alternatives**”, one-day course sponsored by the International Fire Code Institute (IFCI), the International Conference of Building Officials (ICBO), and the Society of Fire Protection Engineers (SFPE), **Tacoma, WA**, January 29, 1999; **Dallas, TX**, April 7, 1999.

“**The Fire Safety Engineering Method**”, five-day course sponsored by Canadian Association of Building Code Officials, **Winnipeg, Canada**, May 30th - June 4th, 1999.

“**Advanced Computer Fire Modeling**”, two-day course sponsored by the Society of Fire Protection Engineers (SFPE), **New Orleans, LA**, November 11 – 12, 1999; **Baltimore, MD**, October 4 – 5, 2000, **Santa Fe, NM**, March 14 – 15, 2002.

“**Introduction to Fire Dynamics Simulator (FDS) and Smokeview**”, three-day course sponsored by the Society of Fire Protection Engineers (SFPE), **Baltimore/Washington**, September 16 – 18, 2002, **Las Vegas**, March 23 – 25, 2004, **Chicago**, September 21-23, 2004, **Hawaii**, February 1-3, 2005, **Chicago**, August 14 -16, 2006.

“**Advanced Fire Dynamics Simulator (FDS) and Smokeview**”, three-day course sponsored by the Society of Fire Protection Engineers (SFPE), **San Diego**, October 19 – 21, 2005, **Baltimore**, October 18 – 20, 2006, **Las Vegas**, October 16 – 19, 2007, **Charlotte, NC**, October 15-17, 2008, **Scottsdale, AZ**, October 21 – 23, 2009.

SELECTED PUBLICATIONS AND PRESENTATIONS:

Presentations (Non-Peer Reviewed):

Felthous, A. R., Weinstock, R., Carpenter, D. J., Martell, D. A., Oxley, J. C., Shefchick, T. P., Ubelacker, D., Warnick, A. J., Lentini, J., Yang, S., and Upshaw Downs, J. C., “**Fires and Explosions: A Multidisiplinary Overview of Investigative Methods, mental States of Perpetrators, and Psychological Trauma to Victims**,” W17, American Academy of Forensic Sciences, Annual Meeting, Seattle, Washington, February 22-27, 2010.

Dubs, L. A. and Carpenter, D. J., “**Forensic Science (Arson): Talisman or Trickery?**,” Seminar, North Carolina Advocates for Justice, Raleigh, NC, April 16, 2010.

- Carpenter, D., Warnick, A., Ubelacker, D., and Martell, D, “**Forensic Sampler: Firesetting and Bombing**,” 40th Meeting of the American Academy of Psychiatry and the Law, Baltimore, MD, October 29th – November 1, 2009.
- Carpenter, D., “**Practical Application of Fundamental Knowledge in Fire and Explosion Investigations**,” Canadian National Advanced Fire, Arson and Explosion Investigation Training Program, Toronto, Canada, October 29th, 2009.
- Carpenter, D. J., “**The Forensic Model**,” Session 4: The Real World – What Do We Actually Do with Fire Models? , Fire Modeling Workshop, National Institute of Standards and Technology (NIST), Gaithersburg, MD, Wednesday, April 29, 2009.
- Carpenter, D. J., and McAllister, J. M., “**Practical Application of Engineering Principals**,” International Association of Arson Investigators, 59th Annual Training Conference, Denver, Colorado, April 27 - May 2, 2008.
- Stauffer, E., Byron, D. E., and Carpenter, D. J., “**Analysis of Vegetable and Animal Oil Residues From Fire Debris Samples**,” W17, American Academy of Forensic Sciences, Annual Meeting, San Antonio, Texas, February 19-24, 2007.
- Cummings, W. M., and Carpenter, D. J., “**Performance-Based Analysis of ARFF Requirements at USAP Airfields**,” American Society of Civil Engineers (ASCE), Cold Regions Engineering Conference, Anchorage, AK, May 22, 2002.
- Carpenter, D. J., Zhang, W., Roby, R. J., “**Fire Dynamics Simulator (FDS)**,” National Institute of Standards and Technology, Seminar, November 19, 2002.
- Carpenter, D. J., “**Fire Protection in Antarctica**,” presented to the Chesapeake Chapter of the Society of Fire Protection Engineers, **College Park, Maryland**, April 30, 1998; New England Chapter of the Society of Fire Protection Engineers, **Boston, MA**, February 7, 2000.
- Watts, J. M., Jr., and Carpenter, D. J., “**Fire Dynamics and Fire Modeling & Human Behavior in Fire and Performance-Based Fire Safety Evaluation**”, State of Vermont, Department of Labor, **Rutland, VT**, January 31st, 2000.
- West, L. E., Reiter, D. A., and Carpenter, D. J., “**Forensic Fire Investigation**”, The 2000 Claims Conference, Professional Loss Research Bureau (PLRB), **Chicago, IL**, March 26 – 29, 2000.
- Carpenter, D. J., “**The Use of Quantitative Tools in Fire Investigation**,” presented to the Vermont Chapter of the International Association of Arson Investigators, **Randolph Center, VT**, December 3, 1998; New Jersey Chapter of the International Association of Arson Investigators, **Morristown, NJ**, June 18, 1999.

Carpenter, D. J., Beller, D., and Sapochetti, J., “**Using the “Scientific Method” in the Analysis of the Cause and Origin of the Fire at the Coconut Grove: Development of a New Hypothesis**”, NFPA World Fire Safety Congress and Exposition, **Baltimore, MD**, May 16-20, 1999.

Carpenter, D. J., and Roby, R. J., “**Advanced Investigation and Technology: Application and Presentation of Fire Modeling in Arson Investigations**,” presented to the National Society of Professional Insurance Investigators 1999 Advanced Insurance Fraud Seminar, **Cincinnati, OH**, November 11, 1999.

Carpenter, D. J. and Hamer, A. J., “**The Modeling of Experimental Compartment Fires Using Computational Fluid Dynamics**,” presented at the 1998 STAR-CD North America User’s Conference, **Detroit, MI**, May 19-20, 1998.

Conference Poster Sessions (Editorially Reviewed):

Carpenter, D. J., and DiNenno, P. J., “**Halon Alternative Selection Tool Software**”, *Proceedings of the Halon Alternatives Technical Working Conference*, May 6-8, 1997, Albuquerque, NM.

Carpenter, D. J., and Barnett, J. R., “**The Modeling of Fire Tests Conducted at the National Research Council of Canada Using the Fire Field Model JASMINE**,” presented at the International Conference on Fire Research and Engineering, Orlando, FL, September 10-15, 1995.

Conference Papers (Editorially Reviewed):

Carpenter, D. J., Roby, R. J., and Torero, J. L., “**The Use of Toxicity Data in the Reconstruction and Analysis of Fires**,” *Proceedings of the 2nd International Symposium on Fire Investigation Science and Technology*, National Association of Fire Investigators, University of Cincinnati, June 28 – 30, 2006.

Carpenter, D. J., Roby, R. J., and Torero, J. L., “**Training vs. Education: The Case for the Development of a National Curriculum for Fire Investigators**,” *Proceedings of the 2nd International Symposium on Fire Investigation Science and Technology*, National Association of Fire Investigators, University of Cincinnati, June 28 – 30, 2006.

Ferrino-McAllister, J. L., Carpenter, D. J., and Roby, R. J., “**Comparison of Gasoline Weathering on Carpet Samples Exposed to Various Thermal Environments**,” *Proceedings of the 2nd International Symposium on Fire Investigation Science and Technology*, National Association of Fire Investigators, University of Cincinnati, June 28 – 30, 2006.

Sutula, J. A., Carpenter, D. J., Anderson, J., and Cometto, A., “**The Use of Animation as an Aid in the Presentation of Results of Computational Fluid Dynamics Modeling in Fire**”

Reconstruction Analysis,” *Proceedings of the 2nd International Symposium on Fire Investigation Science and Technology*, National Association of Fire Investigators, University of Cincinnati, June 28 – 30, 2006.

Carpenter, D. J., and Cummings, W., “**Performance-Based Analysis of ARFF Requirements for Air-Fields at McMurdo and South Pole Stations, Antarctica,**” NFPA World Safety Conference, Dallas, TX, May 18 - 21, 2003.

Carpenter, D. J. and Zhang, W., “**Validation of Fire Modeling by Fire Dynamic Simulator for Fire Protection Engineering,**” NFPA World Safety Conference, Dallas, TX, May 18-21, 2003.

Zhang, W., N. L. Ryder, R. J. Roby, and D. J. Carpenter, “**Modeling of the Combustion in a Compartment Fire by Large Eddy Simulation Approach,**” *Proceedings of the Chemical and Physical Processes in Combustion*, Eastern States Section of the Combustion Institute Fall Technical Meeting, Hilton Head, SC, December 2001.

Sutula, J. A., Carpenter, D. J., and Roby, R. J., “**Use of the FDS Model to Analyze Two Competing Scenarios in an Alleged Arson Case,**” presented at 3rd Technical Symposium on Computer Applications in Fire Protection Engineering, Society of Fire Protection Engineers, Baltimore, MD, September 2001.

Zhang, W., Hamer, A. J., Klassen, M. S., Carpenter, D. J., and Roby, R. J., “**Verification of the Turbulence Statistics for Fire Dynamic Simulator in a Room Fire,**” presented at 3rd Technical Symposium on Computer Applications in Fire Protection Engineering, Society of Fire Protection Engineers, Baltimore, MD, September 2001.

Zhang, W., Hamer, A., Klassen, M., Carpenter, D., and Roby, R., “**Turbulence Statistics in a Fire Room Model by Large Eddy Simulation,**” presented at 2nd Joint Meeting of the U.S. Sections of the Combustion Institute, Oakland, CA, March 2001.

Carpenter, D. J., “**Development of a Waiver/Deviation Process for Determining Equivalent Fire Protection at United States Research Stations in Antarctica,**” presented at the International Conference on Performance-Based Fire Safety Codes and Design Methods, Ottawa, Canada, September 23-26, 1996.

Journal Publications (Peer Reviewed):

Zhang, W., Olenick, S. M., Klassen, M. S., Carpenter, D. J., Roby, R. J., and Torero, J. L., “**A Smoke Detector Activation Algorithm for Large Eddy Simulation Fire Modeling,**” *Fire Safety Journal*, 43, pp. 96 – 107, 2008.

Olenick, S. M., and Carpenter, D. J., “**An Updated International Survey of Computer Models fro Fire and Smoke,**” *Journal of Fire Protection Engineering*, Vol. 13, No. 2, 2003.

Zhang, W., Hamer, A., Klassen, M., Carpenter, D., and Roby, R., "**Turbulence Statistics in a Fire Room Model by Large Eddy Simulation**," *Fire Safety Journal*, 37, pp. 721-752, 2002.

Wade, C. A., and Carpenter, D. J., "**A Performance-Based Analysis of an Industrial Facility Containing Flammable Liquid Storage**," *Journal of Fire Protection Engineering*, Vol. 9, No. 2, 1998.

Carpenter, D. J., and Wade, C. A., "**A Performance-Based Fire Hazard Analysis of an Industrial Process Using Pressurized Hydraulic Fluids**," in preparation for submission to the *Journal of Fire Protection Engineering*.

Published Reports:

Carpenter, D. J., Churchward, D. L., Lentini, J. J., McKenzie, M. A., and Smith, D. A., "**Report on the Peer Review of the Expert Testimony in the Cases of State of Texas v. Cameron Todd Willingham and State of Texas v. Ernest Ray Willis**," Arson Review Committee, Innocence Project, April, 2006.

DiNenno, P. J., Verdonik, D. P., and Carpenter, D. J., "**U.S. Navy Halon 1211 Replacement Plan Part I - Development of Halon 1211 Alternatives**," Navy Research Laboratory (NRL), NRL/MR/6180-99-8410, November 1, 1999.

Mawhinney, J. R., and Carpenter, D. J., "**A Review of Fire Hazards and Fire Suppression Options for the Halifax Class Frigates of the Canadian Navy**," Client Report A-4424.1, for Department of National Defence, National Research Council Canada, Ottawa, Canada, March 10, 1997.

Amy, J., Carpenter, D. J., and Pucci, W. E., "**Alternative Combustible Loading: Conceptual Matrix Development and Implementation (U)**", WSRC-RP-93-1445, Westinghouse Savannah River Company, Savannah River Site, Aiken, SC, October 29, 1993.

Carpenter, D. J., "**Alternative Combustible Loading: An Overview and Methodology Framework (U)**", WSRC-RP-93-1194, Westinghouse Savannah River Company, Savannah River Site, Aiken, SC, September 30, 1993.

HANDBOOK CHAPTERS:

Walton, W. D., Carpenter, D. J., and Wood, C. B., "Deterministic Computer Fire Models," 19th edition, *Fire Protection Handbook*, Chapter 5, Section 3, National Fire Protection Association, Quincy, MA, 2003.

Beyler, C. L., DiNenno, P. J., Carpenter, D. J., and Watts, J. M., Jr., "Introduction to Fire Modeling," 20th edition, *Fire Protection Handbook*, Chapter 5, Section 3, National Fire Protection Association, Quincy, MA, 2008.

Carpenter, D. J., "Fire Modeling and Its Application in Fire Investigation," *Wiley Encyclopedia of Forensic Science*, John Wiley & Sons, New York, June, 2009.

TELEVISION PROGRAMS:

CNN's "Burden of Proof with Greta Van Susteren & Roger Cossack," Waco Simulation: Burning Questions of the Branch Dravidian Fire, March 23, 2000.

CNN's "Anderson Cooper 360," Arson Science, April 10, 2007.

Abenteuer Wissen, (German Television), Knowledge Adventures: Fatal Mistakes in the Blaze, August 31, 2007.

Investigation Discovery's "Forensics: You Decide," Episode 3: Up in Flames, August 2009.

ABC's 20/20, "Burned: Fire Scientists Question Arson Findings", Episode 3018, May 7th, 2010.

NEWSPAPER ARTICLES:

"More Arson Convictions Challenged by Science," Maurice Possley, Chicago Tribune, October 18, 2006.

"Arson Convictions, Fire Investigations Feel the Heat", Sue Russell, Miller-McCune Newsletter (<http://www.miller-mccune.com/article/arson-convictions-fire-investigations-feel-the-heat-980>), February 7, 2009.

"I Was Just A Junkie", Dave Mann, The Texas Observer (<http://www.texasobserver.org/features/i-was-just-a-junkie>), October 2, 2009.