

Chris Lautenberger, PhD, PE

Reax Engineering, Inc.
1921 University Ave.
Berkeley, CA 94704

510-387-2155

lautenberger@reaxengineering.com



Professional Profile

Chris Lautenberger is a co-founder of Reax Engineering Inc. in Berkeley, CA. His responsibilities span building code and fire code consulting, fire science research, design of fire protection and life safety systems, thermal sciences, atmospheric processes, and forensic reconstruction of fires. Lautenberger's work combines fire/building codes and related standards with technical aspects of fire science such as combustion, heat transfer, fluid dynamics, thermodynamics, fire dynamics, and fire modeling. Dr. Lautenberger has co-taught Masters-level courses in Fire Dynamics and Fire Modeling in the Department of Fire Protection Engineering at California Polytechnic State University, San Luis Obispo. Before co-founding Reax Engineering, he worked as a Fire Protection Engineer at Arup Fire in San Francisco, CA.

Professional Licensure

Licensed Professional Engineer, State of California, # FP1676 (Fire Protection Engineering)

Education

PhD – Mechanical Engineering, University of California at Berkeley, January 2003 - December 2007

- Dissertation title: “A Generalized Pyrolysis Model for Combustible Solids”
- Major field: Combustion
- Minor fields: Wildland Fire Science and Fluid Dynamics

MS – Fire Protection Engineering, Worcester Polytechnic Institute, January 2000 - December 2001

- Thesis title: “CFD Simulation of Soot Formation and Flame Radiation”

BS – Mechanical Engineering, Worcester Polytechnic Institute, August 1995 - December 1999

Professional Experience

8/08 – present **Reax Engineering Inc.** Berkeley, CA *Founding Partner and Principal Engineer*

Representative activities:

- Fire protection engineering – code consulting, fire/life safety systems, sizing of atrium smoke exhaust systems, development of equivalencies or alternate methods of design, peer review
- Fire modeling – smoke alarm/detector activation, heat detector/sprinkler activation, time to untenability or incapacitation by smoke and heat
- Prediction of smoke and heat release rates from small-scale fire test data
- Materials and product flammability assessment – ignitability, combustion, flame spread
- General thermal sciences and fire dynamics analyses and modeling
- Wildland fire modeling and hazard/risk mapping
- Wind/weather modeling and atmospheric dispersion modeling
- Forensic fire reconstruction and origin & cause hypothesis testing

Selected Fire Protection Engineering project work:

- Calculation of Light Rail Vehicle heat release rates in the San Francisco Central Subway using fire growth modeling and fire testing (San Francisco, CA)
- Analysis of rail vehicle design fires, testing, and modeling for Los Angeles County Metropolitan Transit Authority (Los Angeles, CA)
- Material property estimation for fire development modeling in new rail vehicle
- Development of code compliance and fire protection strategy for rack storage of flammable liquid/aerosol storage in multipurpose warehouse (Reno, NV)

- Development of automatic sprinkler protection criteria and analysis of flammable liquids processes at semiconductor plant (Santa Rosa, CA)
- Analysis of building code and testing requirements for exterior wall requirements and development of an alternate means of protection (Burlington, VT)
- Analysis of building code requirements at new shared works space occupancy (Walnut Creek, CA)
- Application of computer fire modeling and egress modeling to determine appropriate smoke exhaust rate for atrium at Marist College (Poughkeepsie, NY)
- Analysis of wildland urban interface fire and life safety concerns at proposed subdivisions in Oakland, CA, St. Helena, CA, and Encinitas, CA
- Sizing of atrium smoke exhaust rate in the new Student Union Building at San Jose State University (San Jose, CA)
- Development of a model for ignition of HEPA filters by embers at the Hanford nuclear waste treatment plant (Richland, WA)
- Assessment of structural performance-based fire protection/life safety designs while acting as Owner's Representative for a hotel and casino
- Design of FM-200 clean agent fire suppression system for PG&E substation (San Mateo, CA)
- Modeling smoke and heat detector activation to develop a request for alternate means of protection at a large theater (Cincinnati, OH)
- Analysis of fire code issues related to residential gas explosion (Las Vegas, NV)
- Analysis of atrium smoke control system in residential highrise (Dallas, TX)

Selected thermal sciences & general project work:

- Heat transfer analysis and pyrolysis modeling for proposed municipal solid waste to energy incineration technology
- Thermo-chemical analysis and heat transfer modeling of biomass torrefaction (low temperature pyrolysis) reactor
- Detailed Computational Fluid Dynamics (CFD) modeling of fluid flow and heat transfer in a rotary kiln biochar reactor
- CFD-based furnace modeling, heat transfer analysis, and pyrolysis modeling of proposed screw auger wood chip pyrolysis reactor
- Development of a comprehensive three-dimensional computational model for predicting heat release and emissions from charcoal combustion
- Flammability and thermal property assessment of new wall board product
- CFD modeling of blast wave from a bird bomb
- Thermodynamic analysis of non-traditional methods for carbon capture and sequestration
- Calculation of overhead electrical utility catenary curves and excursions in high winds
- Atmospheric dispersion modeling of pollutant transport using EPA's AERMOD software

Selected wildland fire hazard analysis and modeling project work:

- Co-chaired the Peer Development Panel (PDP) that was tasked by the California Public Utilities Commission (CPUC) with developing a statewide fire hazard/risk map that identifies areas at elevated or extreme risk of experiencing wildland or wildland urban interface fires.
- Retained as subject matter expert by several California electrical utilities and communications companies regarding ongoing CPUC proceedings to develop a statewide fire hazard/risk map
- Conducted high resolution wind/weather modeling to analyze historical fire weather in Southern California from 1979 – 2012
- Developed a customized wildland fire hazard model for a large electrical utility. This involved application of high-resolution numerical weather prediction and wildland fire modeling to quantify wildland fire risk associated with overhead electrical utilities
- Determined maximum reasonably foreseeable Santa Ana wind speed in Malibu Canyon using wind modeling and pole-mounted anemometers installed specifically for this project
- Developed ELMFIRE (Eulerian Level Set Model of Fire Spread), a parallelized model for simulating wildland fire spread and quantifying wildland fire risk via Monte Carlo simulation

- High resolution smoke plume modeling to assess potential for Libby Amphibole Asbestos (LAA) to be transported by large-scale wildland fires

Selected wildland fire forensic reconstructions and analyses:

- Reconstruction of initial spread of the 2011 Bastrop Complex Fire (Bastrop, TX)
- Analysis of ignition, initial spread, and smoke transport from the 2009 Murrindindi Bushfire (Victoria, Australia)
- Origin and cause hypothesis testing, fire spread modeling, and fire plume modeling for the 2007 Moonlight Fire near Westwood, CA
- Simulation of smoke transport from the 2010 Crown Fire near Palmdale, CA
- Reconstruction of the spread of the 2008 Iron Complex Fire in Northern California and assessment of the impact of firing activities on timber loss in private inholdings
- Calculation of trajectory and temperature histories of metallic particles allegedly generated by clashing between aluminum and copper electrical conductors and analysis of grass-fire ignition potential, initial spread rate, and plume dynamics (Victoria, Australia)
- Analysis of wildland fires ignited by exhaust particles from a locomotive including analysis of particle trajectories and fuel ignitability (Victoria, Australia)

Selected structure fire forensic reconstructions and analyses:

- Reconstruction of fatal apartment fire where smoke alarms failed to activate (Long Beach, CA)
- Reconstruction of fatal fire in manufactured home (Castleberry, AL)
- Analysis of ignitability of water/antifreeze mixture discharged from residential sprinkler system, analysis of initial fire spread, and assessment of burn injuries (Herriman, UT)
- Analysis of ignition, initial spread, and effect of automatic sprinkler system failure on the outcome of the 2010 Roseville Galleria Fire (Roseville, CA)
- Origin hypothesis testing for fatal alleged arson fire (Calcasieu Parish, Louisiana)
- Fire cause hypothesis testing and analysis of residential LPG explosion for alleged arson fire (Round Mountain, CA)
- Analysis of role of inoperable fire hydrant on manual fire suppression efforts and associated property damage during total loss fire in residential apartment building (Atlanta, GA)
- Reconstruction of fatal apartment fire: inter-apartment fire spread, time to smoke alarm activation, identification of contributory building code issues (Carrboro, NC)

12/10 – present **California Polytechnic State University, San Luis Obispo** *Instructor*

- Fire Protection Engineering Instructor in Cal Poly’s Masters degree program
- Teaching responsibilities include FPE 502 Fire Dynamics and FPE 504 Fire Modeling

12/07 – 2/11 **University of California at Berkeley** *Post Doctoral Researcher*

- Conducted research on NSF Grant 0730556, “Tackling CFD Modeling of Flame Spread on Practical Solid Combustibles”
- Assessed predictive capabilities of Fire Dynamics Simulator (FDS) for simulating flame spread and fire growth
- Modified subroutines to improve predictive capabilities of FDS for flame spread modeling
- Developed pyrolysis model and material property estimation techniques needed to simulate the pyrolysis of real-world solid fuels
- Developed computer model for ignition of fuel beds by hot particles and fire brands to predict ignition of fuel beds and initiation of spot fires

1/02 – 6/08 **Arup Fire** San Francisco, CA *Fire Protection Engineer*

- Assisted clients with fire safety design and achieving code compliance or performance-based solutions for hospitals, casinos, malls, libraries, schools, museums, airports, and offices
- Assessed fire performance of buildings using fire modeling and egress analyses in support of alternate methods of design
- Developed and programmed a CFAST-based Monte-Carlo fire simulator

- Simulated fire development in a rail vehicle and calibrated the model with large-scale experimental fire test data
- Representative projects include Wynn Las Vegas, Hard Rock Hotel and Casino Las Vegas, Kaiser Permanente templates, New Los Angeles Federal Courthouse, San Mateo Public Library, California Academy of Sciences, Bay Area Rapid Transit (BART) Montgomery Street Station, and Seattle Public Library

- 10/00 – 12/01 **FM Global Research (formerly Factory Mutual Research Corporation)** Norwood, MA
- Examined existing soot formation and oxidation models in the literature and used this research to postulate a new engineering soot model that is compatible with FDS
 - Worked with FM Global and NIST scientists to add this new model for soot formation and oxidation to FDS, and performed simulations of laminar and turbulent diffusion flames

- 5/00 – 8/00 **Code Consultants, Inc.** Saint Louis, MO
- Responsible for examining proposed building designs for compliance with relevant codes
 - Performed engineering analyses to support equivalencies

Dissertation and Thesis

- 1/03 – 12/07 **PhD Dissertation** *University of California, Berkeley*
- Developed a generalized pyrolysis/material decomposition model (Gpyro) to simulate the gasification, pyrolysis, and combustion of condensed-phase fuels
 - Developed an optimization technique that uses a genetic algorithm to extract material pyrolysis properties needed for simulation of solid-phase pyrolysis from bench-scale fire tests
 - Performed FDS-based simulations of ignition, flame spread, and fire growth in normal and reduced gravity environments as part of a NASA-sponsored project
- 9/00 – 12/01 **MS Thesis** *Worcester Polytechnic Institute*
- Developed a model for soot formation/oxidation in non-premixed flames
 - Implemented model in FDS to calculate soot formation and flame radiation
- 8/98 – 5/99 **Major Qualifying Project (MQP)** *Worcester Polytechnic Institute*
- Developed an experimental program and ran several real-scale room/corner fire tests in WPI's room calorimeter to evaluate the flame spread characteristics of composite wall linings

Peer Reviewed Publications

1. Lautenberger, C., de Ris, J., Dembsey, N.A., Barnett, J.R. & Baum, H.R., "A Simplified Model for Soot Formation and Oxidation in CFD Simulation of Non-premixed Hydrocarbon Flames," *Fire Safety Journal* **40**: 141-176 (2005).
2. Lautenberger, C., Zhou, Y.Y. & Fernandez-Pello, A.C., "Numerical Modeling of Convective Effects on Piloted Ignition of Composite Materials," *Combustion Science and Technology* **177**: 1231-1252 (2005).
3. Lautenberger, C. & Fernandez-Pello, A.C., "Approximate Analytical Solutions for the Transient Mass Loss Rate and Piloted Ignition Time of a Radiatively Heated Solid in the High Heat Flux Limit," *Fire Safety Science* **8**: 445-456 (2005).
4. Lautenberger, C., Rein, G. & Fernandez-Pello, A.C., "Application of a Genetic Algorithm to Estimate Material Properties for Fire Modeling from Bench-Scale Fire Test Data," *Fire Safety Journal* **41**: 204-214 (2006).
5. Rein, G., Lautenberger, C., Fernandez-Pello, A.C., Torero, J.L. & Urban, D.L., "Application of Genetic Algorithms and Thermogravimetry to Determine the Kinetics of Polyurethane Foam in Smoldering Combustion," *Combustion and Flame* **146**: 95-108 (2006).
6. Rich, D., Lautenberger, C., Torero, J.L., Quintiere, J.G. & Fernandez-Pello, C., "Mass Flux of Combustible Solids at Piloted Ignition," *Proceedings of the Combustion Institute* **31**: 2653-2660 (2007).
7. Kwon, J.-W., Dembsey, N.A., & Lautenberger, C.W., "Evaluation of FDS v4: Upward Flame Spread," *Fire Technology* **43**: 255-284 (2007).
8. Avila, M.B., Dembsey, N.A., Kim, M.E., Lautenberger, C., & Dore, C., "Fire Characteristics of Polyester FRP composites with Different Glass Contents," *Composites Research Journal* **2**: 1-14 (2008).

9. Lautenberger, C., Kim, E., Dembsey, N. & Fernandez-Pello, C., "The Role of Decomposition Kinetics in Pyrolysis Modeling – Application to a Fire Retardant Polyester Composite," *Fire Safety Science* **9**: 1201-1212 (2008).
10. Dodd, A.B., Lautenberger, C. & Fernandez-Pello, A.C., "Numerical Examination of Two-Dimensional Smolder Structure in Polyurethane Foam," *Proceedings of the Combustion Institute* **32**: 2497-2504 (2009).
11. Lautenberger, C. & Fernandez-Pello, A.C., "Generalized Pyrolysis Model for Combustible Solids," *Fire Safety Journal* **44**: 819-839 (2009).
12. Lautenberger, C. & Fernandez-Pello, A.C., "A Model for the Oxidative Pyrolysis of Wood," *Combustion and Flame* **156**: 1503-1513 (2009).
13. Hadden, R., Scott, S., Lautenberger, C., & Fernandez-Pello, A.C., "Ignition of Combustible Fuel Beds by Hot Particles: an Experimental and Theoretical Study," *Fire Technology* **47**: 341-355 (2011).
14. Fereres, S., Lautenberger, C., Fernandez-Pello, C., Urban, D.L., & Ruff, G.A., "Mass Loss Rate at Ignition in Reduced Pressure Environments," *Combustion and Flame* **158**: 1301-1306 (2011).
15. Lautenberger, C. & Fernandez-Pello, C., "Optimization Algorithms for Material Pyrolysis Property Estimation," *Fire Safety Science* **10**: 751-764 (2011).
16. Dodd, A.B., Lautenberger, C., & Fernandez-Pello, A.C., "Computational Modeling of Smolder Combustion and Spontaneous Transition to Flaming," *Combustion and Flame* **159**: 448-461 (2012).
17. Matala, A., Lautenberger, C., & Hostikka, S., "Generalized direct method for pyrolysis kinetics parameter estimation and comparison to existing methods," *Journal of Fire Sciences* **30**: 339-356 (2012).
18. Fereres, S., Lautenberger, C., Fernandez-Pello, A.C., Urban, D.L., and Ruff, G.A., "Understanding ambient pressure effects on piloted ignition through numerical modeling," *Combustion and Flame* **159**: 3544-3553 (2012).
19. Wong, W., Alston, J., Lautenberger, C., and Dembsey, N., "CFD Flame Spread Model Validation: Multi-component Data Set Framework," *Journal of Fire Protection Engineering* **23**: 85-134 (2013).
20. Lautenberger, C., "Wildland Fire Modeling with an Eulerian Level Set Method and Automated Calibration," *Fire Safety Journal* **62**: 289-298 (2013).
21. Lautenberger, C., "Gpyro3D: A Three Dimensional Generalized Pyrolysis Model," *Fire Safety Science* **11**: 193-207 (2014).
22. Fernandez-Pello, A.C., Lautenberger, C., Rich, D., Zak, C., Urban, J., Hadden, R., Scott, S., and Fereres, S., "Spot fire ignition of natural fuel beds by hot metal particles, embers, and sparks," *Combustion Science and Technology* **187**: 269-295 (2015).
23. Yashwanth, B.L., Shotorban, B., Mahalingam, S., Lautenberger, C.W., and Weise, D.R., "A numerical investigation of the influence of radiation and moisture content on pyrolysis and ignition of a leaf-like fuel element," *Combustion and Flame* **163**: 301-316 (2016).
24. Lautenberger, C., "Mapping Areas at Elevated Risk of Large-Scale Structure Loss Using Monte Carlo Simulation and Wildland Fire Modeling," *Fire Safety Journal* **91**: 768-775 (2017).

Book Chapters

1. Lautenberger, C., Torero, J.L. & Fernandez-Pello, A.C., "Understanding Materials Flammability," in *Flammability Testing of Materials Used in Construction, Transport and Mining*, Edited by V. Apte, Woodhead Publishing, Cambridge, UK pp. 1-21, 2006.
2. Lautenberger, C. & Fernandez-Pello, A.C., "Pyrolysis Modeling, Thermal Decomposition, and Transport Processes in Combustible Solids," in *Transport Phenomena in Fires*, Edited by M. Faghri and B. Sunden, WIT Press, Billerica, MA pp. 209-248, 2008.
3. Lautenberger, C. & Fernandez-Pello, A.C., "Spotting Ignition of fuel beds by firebrands," in *Computational Methods and Experimental Measurements XIV*, Edited by C.A. Brebbia and G.M. Carlomango, WIT Press, Billerica, MA pp. 603-612, 2009.
4. Lautenberger, C. & Hostikka, S., "Large Scale Fire Modeling," in *Flame Retardancy of Polymeric Materials*, Second Edition, Edited by C.A. Wilkie and A.B. Morgan, Marcel Dekker pp. 551 – 585, 2010.
5. Lautenberger, C., Tien, C.L., Lee, K.Y., and Stretton, A.J., "Radiation Heat Transfer," in *SFPE Handbook of Fire Protection Engineering*, 5th Edition, Springer, pp. 102-137 (2016).
6. Lautenberger, C., "Pyrolysis," in *Encyclopedia of Wildfires and Wildland-Urban Interface (WUI) Fires*, Ed. Manzello, S.L., Springer, in press (2018).

Selected Conference Publications and Technical Reports

1. Beyler, C., Hunt, S., Lattimer, B., Iqbal, N., Lautenberger, C., Dembsey, N., Barnett, J., Janssens, M., & Dillon, S. "Prediction of ISO 9705 Room/Corner Test Results". United States Department of Transportation. United States Coast Guard Research and Development Center. Washington, DC. 1999.

2. Lautenberger, C., Stevanovic, A., Rich, D., & Torero, J., "Effect of Material Composition on Ignition Delay of Composites," *Composites 2003*, Anaheim CA, October 2003.
3. Lautenberger, C., Stevanovic, A., Rich, D., Torero, J. & Fernandez-Pello, A.C., "An Experimental and Theoretical Study on the Ignition Delay Time of Composite Materials," *Western States Section/The Combustion Institute*, Los Angeles CA, October 2003.
4. Rein, G., Lautenberger, C., Fernandez-Pello, A.C., Torero, J.L. & Urban, D.L., "Derivation of the Kinetics Parameters of Polyurethane Foam Using Genetic Algorithms," *Fourth Joint Meeting of the US Sections of the Combustion Institute*, Philadelphia PA, March 2005.
5. Rein, G., Lautenberger, C. & Fernandez-Pello, A.C., "On the Derivation of Polyurethane Kinetics Parameters Using Genetic Algorithms and its Application to Smoldering Combustion," *Fourth International Conference on Computational Heat and Mass Transfer*, Paris France, Vol. 1 pp. 578-584, May 2005.
6. Rein, G., Lautenberger, C. & Fernandez-Pello, A.C., "Using Genetic Algorithms to Derive the Parameters of Solid-Phase Combustion from Experiments," *20th International Colloquium on the Dynamics of Explosions and Reactive Systems*, Montreal, Canada, August 2005.
7. Rich, D., Lautenberger, C., McAllister, S. & Fernandez-Pello, A.C., "Microgravity Flame Spread Rates Over Samples of Polymer and Polymer/Glass Composites," *Western States Section/The Combustion Institute*, Boise ID, March 2006.
8. Coles, A., Wolski, A., Lautenberger, C.W., & Dembsey, N.A., "Building Code Requirements for Performance Based Designs and Fire Modeling", *Composites 2006*, St. Louis, MO, October 2006.
9. Lautenberger, C., McAllister, S., Rich, D., & Fernandez-Pello, C., "Modeling the Effect of Environmental Variables on Opposed-Flow Flame Spread Rates with FDS," *International Congress on Fire Safety in Tall Buildings*, Santander, Spain, October 2006.
10. McAllister, S., Rich, D., Lautenberger, C., & Fernandez-Pello, C., "Modeling Microgravity and Normal Gravity Opposed Flame Spread over Polymer/Glass Composites," *45th AIAA Aerospace Sciences Meeting and Exhibit*, Reno, NV, January 2007, AIAA Paper 2007-740.
11. Lautenberger, C., McAllister, S., Rich, D., & Fernandez-Pello, C., "Effect of Environmental Variables on Flame Spread Rates in Microgravity," *45th AIAA Aerospace Sciences Meeting and Exhibit*, Reno, NV, January 2007, AIAA Paper 2007-383.
12. Chatterjee, P., de Ris, J.L., & Lautenberger, C.W., "A General Combustion Model for Radiation Dominated Non-premixed Flames," *Fifth International Seminar on Fire and Explosion Hazards*, Edinburgh, UK, 2007.
13. McAllister, S., Rich, D., Lautenberger, C., Fernandez-Pello, C. & Yuan, Z.G., "Modeling Microgravity and Normal Gravity Flame Spread Rates over Samples of Polymer and Polymer/Glass Composites," *Fifth International Seminar on Fire and Explosion Hazards*, Edinburgh, UK, April 2007.
14. Lautenberger, C. & Fernandez-Pello, C., "A Generalized Pyrolysis Model for Combustible Solids," *Fifth International Seminar on Fire and Explosion Hazards*, Edinburgh, UK, April 2007.
15. Coles, A., Wolski, A., & Lautenberger, C., "Using Fire Dynamics Simulator for Fire Growth Modeling," *Interflam 2007*, London, UK, September 2007.
16. Dembsey, N., Avila, M., Kim, E., Lautenberger, C., & Dore, C., "Fire Characteristics of Polyester FRP Composites with Different Glass Contents," *Composites & Polycon 2007* Tampa, FL, October 2007.
17. Lautenberger, C. & Fernandez-Pello, A.C., "Modeling Ignition of Combustible Fuel Beds by Embers and Heated Particles," *Forest Fires 2008*, 2008.
18. Coles, A., Lautenberger, C., Wolski, A., Smits, B., & Wong, K., "Using Computer Fire Modeling to Reproduce and Predict FRP Composite Fire Performance," *Composites & Polycon 2009*, 2009.
19. Kim, E., Dembsey, N., & Lautenberger, C., "Parameter Estimation for Pyrolysis Modeling Applied to Polyester FRP Composites with Different Glass Contents," *Fire and Materials 2009*, 2009.
20. Lautenberger, C., Wong, W., Dembsey, N., Coles, A., & Fernandez-Pello, C., "Large-Scale Turbulent Flame Spread Modeling with FDS5 on Charring and Noncharring Materials," *Fire and Materials 2009*, 2009.
21. Coles, A., Wolski, A., & Lautenberger, C., "Predicting Design Fires in Rail Vehicles," *13th International Symposium on Aerodynamics and Ventilation of Vehicle Tunnels (ISAVVT 13)*, 2009.
22. Dodd, A.B., Lautenberger, C., & Fernandez-Pello, A.C. "Numerical Modeling of Smoldering Combustion and Transition to Flaming," *Sixth US National Combustion Meeting*, University of Michigan, Ann Arbor, MI, 2009.
23. Scott, S, Hadden, R., Fereres, S., Lautenberger, C., & Fernandez-Pello, A.C., "Ignition of Combustible Fuel Beds by Embers and Heated Particles," *Western States Section/The Combustion Institute*, Irvine, CA, October 2009.
24. Fereres, S., Lautenberger, C., Fernandez-Pello, C., Urban, D., & Ruff, G., "Effect of Ambient Pressure on Mass Loss Rate at Piloted Ignition," *Western States Section/The Combustion Institute*, Boulder, CO, March 2010.
25. Lautenberger, C., Rich, D., Kramer, M., Fernandez-Pello, C., and Stephens, S., "Communication Infrastructure Provider Assets in the Wildland Setting: CIP Fire Threat Map," June 9, 2010.

26. Lautenberger, C., Wong, W.C., Coles, A., Dembsey, N., & Fernandez-Pello, C., "Comprehensive Data Set for Validation of Fire Growth Models: Experiments and Modeling," *Interflam 2010*, Nottingham, UK, July 2010.
27. Thiry, A., Suzanne, M., Bellivier, A., Bazin, H., Coppalle, A., & Lautenberger, C., "Different Approaches for Fire Source Modeling – Application to Arcueil Experiments," *Interflam 2010*, Nottingham, UK, July 2010.
28. Dodd, A., Lautenberger, C., Fernandez-Pello, C., & Putzeys, O., "Examination of the Spontaneous Transition from Smoldering to Flaming: Comparison of Simulations and Experiments," *Interflam 2010*, Nottingham, UK, July 2010.
29. Fereres, S., Lautenberger, C., Fernandez-Pello, C., Ruff, G., & Urban, D., "Modeling the effect of ambient variables on piloted ignition of solid combustible materials," *Seventh US National Combustion Meeting*, March 2011.
30. Matala, A., Lautenberger, C., & Hostikka, S., "Direct method for estimation of pyrolysis kinetics and comparison to existing methods," *Seventh US National Combustion Meeting*, March 2011.
31. Lautenberger, C., "Modeling Wildland Fire Spread Using an Eulerian Level Set Method and High Resolution Numerical Weather Prediction," *International Congress on Fire Computer Modeling*, October 2012, Santander, Spain.
32. Lautenberger, C., Sexton, S., & Rich, D., "Understanding Long Term Low Temperature Ignition of Wood," *International Symposium on Fire Investigation Science and Technology*, College Park, MD, September 22-24, 2014, p. 361.
33. Zicherman, J., Lautenberger, C., & Wolski, A., "Challenges in Establishing Design Fires for Passenger Rail Vehicles," *Proceedings of Fire and Materials 2015*, Interscience Communications, February 2-4 2015, San Francisco, CA, pp. 749 – 764.

Short Courses

1. *Lawrence Livermore National Laboratories Fire Modeling Short Course – A Short Course Presented to Fire Protection Engineers*. Co-taught, with Professor James Milke (University of Maryland) and Professor Frederick Mowrer (California Polytechnic State University), a 3-day short course on fire dynamics and fire modeling for Lawrence Livermore and Lawrence Berkeley National Laboratories employees (March 20 – 22, 2012).

Selected Presentations and Invited Lectures

1. "A Practical CFD Model for Soot Formation and Flame Radiation," *International Conference on Engineered Fire Protection Design*, San Francisco, CA, June 13, 2001.
2. "Effect of Material Composition on Ignition Delay of Composites," *Composites 2003 Convention and Trade Show*, Anaheim, CA, October 2, 2003.
3. "Experimental and Theoretical Study on Ignition Delay of Composites," *Western States Section of the Combustion Institute Fall 2003 Meeting*, Los Angeles, CA, October 20, 2003.
4. "Approximate Analytical Solutions for the Transient Mass Loss Rate and Piloted Ignition Time of a Radiatively Heated Solid in the High Heat Flux Limit," *The Eighth International Symposium on Fire Safety Science*, Beijing, China, September 20, 2005.
5. "Effect of Environmental Variables on Flame Spread Rates in Microgravity," *45th AIAA Aerospace Sciences Meeting and Exhibit*, Reno, NV, January 8, 2007.
6. "Generalized Pyrolysis Model for Combustible Solids," *2007 Annual Fire Conference*, National Institute of Standards and Technology, Gaithersburg, MD, April 4, 2007.
7. "Generalized Pyrolysis Model for Combustible Solids," *5th International Seminar on Fire and Explosions Hazards*, Edinburgh, UK, April 24, 2007.
8. "Generalized Pyrolysis Model for Combustible Solids," FM Global Research, Norwood, MA, June 19, 2007 (invited seminar).
9. "Pyrolysis Modeling – What Level of Accuracy is Needed to Match Current Gas-Phase Accuracy?," *The Ninth International Symposium on Fire Safety Science*, Fire Spread Modeling Workshop, Karlsruhe, Germany, September 21, 2008 (invited presentation).
10. "Estimating Material Properties for Numerical Pyrolysis Modeling from Laboratory Experiments," *The Ninth International Symposium on Fire Safety Science*, Karlsruhe, Germany, September 21, 2008 (invited presentation).
11. "The Role of Decomposition Kinetics in Pyrolysis Modeling – Application to a Fire Retardant Polyester Composite," *The Ninth International Symposium on Fire Safety Science*, Karlsruhe, Germany, September 26, 2008.
12. "Fire Growth Modeling in Buildings – Where We Are and Where We Need to Be," IIE Seminar, University of Edinburgh, Edinburgh, UK, October 30, 2008 (invited seminar).

13. "Some Unsolved Problems in Fire Dynamics: The Needed Physics and Mathematics," *Mathematical Problems in Fire Safety Engineering Joint Workshop*, Edinburgh, UK, October 31, 2008 (invited seminar).
14. "Large-Scale Turbulent Flame Spread Modeling with FDS5 on Charring and Noncharring Materials," *Fire and Materials 2009*, San Francisco, CA, January 26, 2009.
15. "Fire Growth Modeling: Small-Scale Flammability Tests to Large Scale Fire Behavior," *ASTM E5 Research Review*, Vancouver, BC, June 15, 2009 (invited presentation).
16. "Optimization Algorithms for Material Pyrolysis Property Estimation," *The Tenth International Symposium on Fire Safety Science*, College Park, MD, June 21, 2011.
17. "The Role of Fire Science, Fire Dynamics, and Fire Modeling in Testing Forensic Fire Investigation Hypotheses," IIE Seminar, University of Edinburgh, Edinburgh, UK, August 20, 2012 (invited seminar).
18. "Modeling Wildland Fire Spread Using an Eulerian Level Set Method and High Resolution Numerical Weather Prediction," *International Congress on Fire Computer Modeling*, October 19, 2012, Santander, Spain.
19. "Gpyro3D: A Three Dimensional Generalized Pyrolysis Model," *The Eleventh International Symposium on Fire Safety Science*, Christchurch, New Zealand, February 10, 2014.
20. "Understanding Long Term Low Temperature Ignition of Wood," *International Symposium on Fire Investigation Science and Technology*, College Park, MD, September 22, 2014.
21. "Current Status of Applied Fire Dynamics Simulations," 2015 Northern California/Nevada SFPE Fire Protection Engineering Seminar, San Ramon, CA, April 8, 2015 (invited seminar).
22. "Identifying Areas with Elevated Risk of Large-Scale Structure Loss from Wildland Fires," *The 12th International Symposium on Fire Safety Science*, Lund, Sweden, June 14, 2017.
23. "Wildfire Modeling and Risk of Potential Structure Loss," *2018 Annual Society of Fire Protection Engineers Greater Atlanta Chapter Fire Safety Conference*, Duluth, GA, March 14, 2018.

Publication and Presentation Awards

- Best Paper Overall at *Composites & Polycon 2007*, Tampa, FL, October 2007 for Dembsey, N. *et al.*, "Fire Characteristics of Polyester FRP Composites with Different Glass Contents," presented by N. Dembsey.
- Best paper (second prize) at the *Fifth International Seminar on Fire and Explosion Hazards*, Edinburgh, UK, April 2007 for Lautenberger, C. & Fernandez-Pello, C., "Generalized Pyrolysis Model for Simulating Charring, Intumescent, Smoldering, and Noncharring Gasification," presented by C. Lautenberger.
- 2011 International Association for Fire Safety Science Best Thesis Award (Americas Region) for 2007 PhD Dissertation entitled "Generalized Pyrolysis Model for Combustible Solids". This IAFSS award recognizes the best research dissertation at the PhD and Masters levels in the field of fire safety science and engineering that was completed between 2007 and 2010.
- International Association for Fire Safety Science Best Paper Award (honorable mention) for 2008 paper entitled "The Role of Decomposition Kinetics in Pyrolysis Modeling – Application to a Fire Retardant Polyester Composite," by Lautenberger, C., Kim, E., Dembsey, N. & Fernandez-Pello, C. [*Fire Safety Science* **9**: 1201-1212 (2008)].
- 2014 Society of Fire Protection Engineer's Jack Bono Award for the paper from Volume 23 of the *Journal of Fire Protection Engineering* that has most contributed to the advancement and application of professional Fire Protection Engineering for the paper entitled "CFD Flame Spread Model Validation: Multi-component Data Set Framework," by Wong, W., Alston, J., Lautenberger, C., and Dembsey, N., [*Journal of Fire Protection Engineering* **23**: 85-134 (2013)].
- 2017 Philip Thomas Medal of Excellence. This is awarded to the author(s) of the best paper presented at the previous International Association for Fire Safety Science (IAFSS) Symposium. It is based on five criteria that are used to identify the best paper: pertinence, utility, significance, rationality, and eloquence.

Conference/Journal Advisory Boards/Technical Committees

- Associate Editor of *Fire Technology*, 2014 - present
- Member of Scientific Advisory Board for *International Congress on Combustion and Fire Dynamics*, Santander, Spain, October 2010
- Member of Technical Program Committee (Compartment Fires) for the *Tenth International Symposium on Fire Safety Science* (IAFSS Symposium), College Park, MD, June 2011
- Member of Scientific Advisory Board for *International Congress on Fire Computer Modeling*, Santander, Spain, October 2012

Journal Referee / Peer Review

- *Advances in Engineering Software*
- *Advances in Materials Science and Engineering*
- *Applied Thermal Engineering*
- *Artificial Intelligence Review*
- *Asia-Oceania Symposium on Fire Science and Technology*
- *Brazilian Journal of Chemical Engineering*
- *Chemical Engineering Science*
- *Combustion and Flame*
- *Combustion Science and Technology*
- *Construction and Building Materials*
- *Ecological Modeling*
- *Energy & Fuels*
- *Engineering Science and Technology*
- *Experimental Thermal and Fluid Science*
- *Express Polymer Letters*
- *Fire and Materials*
- *Fire Safety Journal*
- *Fire Safety Science (IAFSS Symposia)*
- *Fire Technology*
- *Fuel Processing Technology*
- *Industrial & Engineering Chemistry Research*
- *International Colloquium on the Dynamics of Explosions and Reactive Systems*
- *International Journal of Computational Fluid Dynamics*
- *International Journal of Heat and Mass Transfer*
- *International Journal of Thermal Sciences*
- *International Journal of Wildland Fire*
- *Journal of Advances in Modeling Earth Systems*
- *Journal of Fire Protection Engineering*
- *Journal of Fire Sciences*
- *Proceedings of the Combustion Institute*
- *Science of the Total Environment*
- *Thermochimica Acta*