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# Three Things A Fire Chief Should Know About Evidence-Based Fire Suppression

By Michael Ward

**E**vidence-based practice in emergency services is typically associated with medical care; but the term refers to the application of research methodology to guide operational practice and departmental priorities—something that should apply to fire suppression and rescue operations as well. Historically, however, fire service protocols and procedures have developed through trial and error, best practices and tradition.

In firehouse kitchens today, a frequent debate pits science against experience, as firefighters react to the findings from fire dynamics research performed by the National Institute of Standards and Technology (NIST) and Underwriter Laboratories (UL). The conversation surrounding aggressive, transitional and defensive fire-fighting tactics is a vigorous and emotional discussion as some of the research on fire behavior contradicts legacy practices.

NIST research into fire flow dates back to a 1998 Fire Department of New York (FDNY) request to assist with the investigation of the Vandalia Avenue high-rise fire that killed Lieutenant Joseph Cavalieri and Firefighters Christopher Bopp and James Bohan. NIST applied its Fire Dynamics Simulator that showed development of a blowtorch when a door opened.<sup>1</sup>

Fire protection engineers Dan Madrzykowski and Stephen Kerber continued to research the impact of wind-driven fires, including field experiments in Toledo, Ohio; Chicago; and New York City. *NIST Technical Note 1629: Fire Fighting Tactics Under Wind Driven Fire Conditions* provided the basis for a change in our understanding of how fire flow develops within a compartment or structure.<sup>2</sup>

There have been hundreds of research experiments, including field evolutions, exploring fire flow and its impact on ventilation and fire suppression tactics as well as occupant survival. The 2012 Governors Island evolutions, supported by FDNY, established a template for “real world” research, with a technical team of firefighters partnering with UL and NIST researchers to perform a series of well documented and repeatable fire attack evolutions.<sup>3</sup>



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Since the Governors Island experiments, UL has researched:

- Modern and legacy home furnishings
- Effectiveness of vertical ventilation and suppression tactics
- Firefighter exposure to smoke particles
- Firefighter safety and photovoltaic systems
- Positive pressure attack
- Cardiovascular and chemical exposure risks in modern firefighting

This was the third year that the UL/NIST efforts on understanding flow-path management were delivered as a featured presentation in the “big room” at the Fire Department Instructor’s Conference (FDIC). FDIC is where fire suppression innovations often spread from one department or region across the country. It was the “Little Drops of Water” presentation by Lloyd Layman at the 1950 FDIC that electrified the audience and led to the era of high-pressure pumpers using fog nozzles for indirect attacks into sealed rooms.<sup>4,5</sup>

## THREE STEPS FOR IMPLEMENTING EVIDENCE-BASED FIREGROUND TACTICS

### **1) Expand the tactical toolbox through fire-flow evolutions.**

This is a great opportunity to tune-up fire suppression operations by exploring these flow-path tools through evolutions. Typically, fire officers and firefighters hesitate to consider and adopt new techniques until they have practiced using them and believe they are valid.

One department conducted live-fire training in its burn building, modeling the scenario on one of the Governors Island tests. In the first evolution, crews used their current methods; in the other, they used the fire flow method with door control and early application of water from outside the structure.

Each company did both evolutions. They then compared the results and discussed the differences. That not only gave them the opportunity to see for themselves how these techniques worked, but also to adapt any procedures to fit the needs of the agency.

The Los Angeles County Fire Department developed an Exterior Water Application training video that could be a start for your evolutions.<sup>6</sup>



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## 2) Strengthen company officer decision-making

The company officer usually makes the initial assessment of an incident. The officer's analysis and decisions will affect the success and safety of the entire response. Evidence-based practice requires more critical thinking than compliance with an operating procedure.

Fire service leaders need to engage company and command officers in a two-way discussion about changes in fire suppression practices and the impact or implication for their departments.

For example, an operations chief in one suburban department takes recent incidents featured in the news, finds a similar structure within the department's service area and asks company officers to describe how they would handle the incident, sometimes including an on-site walkthrough or a hands-on first-alarm deployment practice.

## 3) Consider structural "Red Flag" dispatch procedures

Many departments increase first-alarm resources to outside fires during low-humidity, high-wind "Red Flag" days. The Houston Fire Department looked at the impact of wind within a structure fire and determined that a steady wind over 10 mph may be the lower threshold for accelerated fire development within structures.<sup>7</sup>

Red Flag wind days may require the initial dispatch of additional suppression and command officers to a reported structure fire. Initial strategy and tactics may be influenced by the direction of the wind, including entering the structure with the wind to your back and selecting a larger initial fire-attack line.

The fire chief can use the science coming from fire suppression research to build upon existing experience, providing evolutions, case studies and walk-throughs to improve company officer decision-making and create a safer, more effective response on the fireground.

### WHERE TO GET MORE INFORMATION:

- Underwriter Laboratories Firefighter Safety Research Center: <http://ulfirefightersafety.com/>
- NIST: <http://www.nist.gov/fire/>
- Modern Fire Behavior (Firefighter Close Calls & UL): <http://modernfirebehavior.com/>
- IAFC Firefighter Safety Through Advanced Research: <http://www.fstaresearch.org/>
- FSTAR compiles one-page fact sheets on research reports: <http://www.fstaresearch.org/featured-studies/>



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### About the author

Michael Ward, MGA, MIFireE, a senior associate with Fitch & Associates, has more than 40 years of experience in emergency services. He retired as the acting EMS chief from a large fire and rescue department, has served as executive director of a hospital-based 911 paramedic and medical transportation service and was an assistant professor and program director at a university medical center.



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