OSAC RESEARCH NEEDS ASSESSMENT FORM

Title of research need: Ventilation Impacts on Fire Patterns

Describe the need: Doors, windows, and other openings in a compartment introduce air, allow the escape of heat and thus affect temperatures and flow patterns. Temperature and flow in turn create and destroy patterns on the compartment surfaces. Given the influence of these factors, a pattern that is observed post fire may or may not be related to the origin. Without a solid understanding of these effects, fire investigators may misinterpret these patterns, thus making an erroneous conclusion about the origin of a fire. A coordinated research program has been started by UL to analyze the effects that ventilation has on the creation and obscuration of fire patterns related to the origin of a fire. This research has identified areas that need further study.

Keyword(s): Ventilation effects, fire patterns, obscuration of fire patterns, fire origin, air, oxygen

Submitting subcommittee(s): Fire & Explosion Investigation **Date Approved:** March 10, 2021

(If SAC review identifies additional subcommittees, add them to the box above.)

Background Information:

1. Does this research need address a gap(s) in a current or planned standard? (ex.: Field identification system for on scene opioid detection and confirmation)

Yes. NFPA 921, Chapter 6, Fire Patterns is ever evolving to address enhanced understanding of the effects of fire and the patterns resulting from ventilation effects. It is currently under review for the next edition of the standard.

2. Are you aware of any ongoing research that may address this research need that has not yet been published (e.g., research presented in conference proceedings, studies that you or a colleague have participated in but have yet to be published)?

No.

3. Key bibliographic references relating to this research need: (ex.: Toll, L., Standifer, K. M., Massotte, D., eds. (2019). Current Topics in Opioid Research. Lausanne: Frontiers Media SA. doi: 10.3389/978-2-88963-180-3)

Custer, R., Wright, C. (1984).Open Windows and Thermal Inversions may Complicate a Fire Investigation. Fire and Arson Investigator,6, p. 89-91.
Cox, A(2013).Origin Matrix Analysis: A Systematic Methodology for the Assessment and Interpretation of Compartment Fire Damage. Fire & Arson Investigator, 64(1).
Gorbett G, Meacham B, Wood C, Dembsey N (2017).Structure and Evaluation of the Process for Origin Determination in Compartment Fires. Fire Technology, doi10.1007/s10694-015-0553-3
Madrzykowski, D., and Weinschenk, C., Impact of Fixed Ventilation on Fire Damage Patterns in Full-Scale Structures, UL Firefighter Safety Research Institute, Columbia, MD, 2019

4. Review the annual operational/research needs published by the National Institute of Justice (NIJ) at https://nij.ojp.gov/topics/articles/forensic-science-research-and-development-technology-working-group-operational#latest? Is your research need identified by NIJ?

Yes.

5. In what ways would the research results improve current laboratory capabilities?

This research need is targeted to improve current fire investigation field work rather than laboratory analyses. This research will serve to better inform fire investigators as to how to approach the interpretation of fire patterns as well as the training they receive in this area. In addition to a comprehensive report, a series of training materials would also be important to the understanding of how ventilation (or the lack thereof) affects fire patterns.

6. In what ways would the research results improve understanding of the scientific basis for the subcommittee(s)?

See Number 5.

7. In what ways would the research results improve services to the criminal justice system?

This research will help the fire investigation community to apply a more systematic approach to fire pattern analysis. This more systematic approach will improve expert opinions and testimony relating to fire pattern analysis.

8. Status assessment (I, II, III, or IV): II

	Major gap in current knowledge	Minor gap in current knowledge
No or limited current research is being conducted	I	III
Existing current research is being conducted	II	IV

This research need has been identified by one or more subcommittees of OSAC and is being provided as an informational resource to the community.