OSAC RESEARCH NEEDS ASSESSMENT FORM

Title of research need: Arc Mapping

Describe the need: Locating and interpreting electric arc damage on components of building electrical systems has been recognized as an origin determination tool for over twenty years. It has been included in NFPA 921 since 2001. The theory and technique of this method is based upon the wiring methods and components that were used in the past. As new techniques and components are used in building electrical systems, the creation of arc damage from a fire and the implications of that damage to origin determination need to be reevaluated. Ongoing research is needed to keep up with developments in electrical system technology such as new types of circuit protection. The proposal for research is to develop a coordinated research program to analyze the effects that electrical equipment such as ground-fault circuit interrupters (GFCI) and arc-fault circuit (AFCI) interrupters have on the process of arc-mapping.

Keyword(s): Fire patterns, origin determination, arc mapping, electrical systems, circuit protection, ground-fault circuit interrupters, arc-fault circuit interrupters

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)

NFPA 921 – 2021 does not address what effects, if any, GFCI and AFCI have on the mapping and interpretation of electrical arc damage.

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)

Babrauskas, V. (2018). Arc Mapping: A Critical Review. Fire Technology, **54**, p.749-780
ATF Technical Bulletin 001 – Visual Characteristics of Fire Melting on Copper Conductors. ATF FRL. No. 2010-DN-BX-K218, Office of Justice Programs, National Institute of Justice, Department of Justice, September 12, 2013.
Weinschenk, Craig, Madrzykowski, Daniel. (2020). Impact of Flashover Fire Conditions on Exposed Energized Electrical Cords/Cables. Fire Technology, 56, 959–991, 2020.

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.

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): IV

	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.