

## The NFPA 921 Effect

Maybe a better title for this would be, *Can I Prove it was Arson?* Back in the day—as we who are “more seasoned”

(or just plain old) like to say—arson was not that complicated. Eliminate everything else—maybe find some unusual burning on the floor or a hole burned through the floor, or some clean and crazed glass—and BOOM: it was arson! The world of *ipse dixit* was alive and well and being practiced on a daily basis. It was arson because the investigator said it was and could simply move on to the “whodunnit?” part of the investigation. Ahhh, the good ol’ days!

But were they really that good? People were being arrested, convicted, sent to prison, and, in some cases, put to death based on this unsubstantiated *ipse dixit* testimony. This wasn’t just on criminal cases. The same practice was alive and well on the civil side. Claims were being denied based on the same type of “evidence.” Lives were being devastated, and sometimes ended, based on the “science” of the day. Most fire investigators were doing a “good job” based on what they knew and had been taught. I was at the National Fire Academy in the summer of 1980 for three weeks. It was the first formal training I received on fire investigation—how the burn-throughs to the floor, spalling to the concrete, clean and crazed glass, and fast fires all meant it was arson. That was the “science” of the day. The world of fire investigation was turned upside down in 1992.



■ Mr. Randy Watson, IAAI-CFI, IAAI-CI, F-IAFI CFEI, CVFI, CFII, is a senior fire investigator, training coordinator, and regional branch manager with S-E-A in Lawrenceville, Georgia. He obtained his B.S. from the University of South Carolina. Prior to joining S-E-A in 1992, he spent 15 years investigating fires and explosions for the fire service, law enforcement, and private sector. Throughout his career, Mr. Watson has qualified as an expert witness and provided testimony in numerous federal, state, and local jurisdictions. He is the current chairman of the NFPA Technical Committee on Fire Investigations, which is responsible for writing NFPA 921 Guide for Fire and Explosion Investigations.

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In 1992, the first edition of NFPA 921 was published. Its 14 chapters and 120 pages sent the fire investigation community into hysterics. This new document, published by an internationally recognized organization, was promoting a new methodology that should be used in fire investigation. This was the first time the scientific method was introduced to the fire investigation community and it was not warmly received. Anything containing the word “scientific” caused great concern with many fire investigators. “They will have us wearing lab coats and pocket protectors before long!” and similar sentiments were expressed with great frequency. The reaction from the fire investigation community continued to be strong and vociferous over the next several editions of the document. Numerous proposals were received by the NFPA 921 Technical Committee to literally remove the word “science” from the document. Even though fire investigators had been using some scientific principles all along, seeing it in print made many extremely uncomfortable. The good ol’ days as investigators knew them were coming to an end. A new day of science-based fire investigations was dawning.

As newly revised editions continued to be published every three years, investigators began to realize that NFPA 921 was not going away. Gradually, the document gained acceptance and it found its place as a leading document on the appropriate methodology of conducting fire investigations among the fire investigation community. Today, nearly every presentation in every fire investigation seminar seems to reference NFPA 921. Other books on fire investigation began referencing it also.

In the 2011 edition of NFPA 921, the Technical Committee took on the task of completely rewriting and reorganizing the chapter on fire cause, in addition to other changes. The reorganization of the chapter was done in a way to mirror the seven steps of the scientific method with the intention of providing the fire investigator with an information flow on fire cause determination that is consistent with the methodology the investigator should be using. A figure was introduced to illustrate the proper application of the scientific method to fire cause determination. A paragraph in

the “Testing the Cause Hypothesis” section, however, caused a big uproar. The paragraph was “18.6.5 Inappropriate Use of the Process of Elimination,” it also came to be known as the “Negative Corpus” section. The paragraph read:

**18.6.5\* Inappropriate Use of the Process of Elimination.** The process of

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A negative corpus  
methodology cannot be tested  
using the scientific method  
because there is no evidence  
by which the hypothesis can  
be challenged or tested.

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determining the ignition source for a fire, by eliminating all ignition sources found, known, or believed to have been present in the area of origin, and then claiming such methodology is proof of an ignition source for which there is no evidence of its existence, is referred to by some investigators as “negative corpus.” Negative corpus has typically been used in classifying fires as incendiary, although the process has also been used to characterize fires classified as accidental. This process is not consistent with the Scientific Method, is inappropriate, and should not be used because it generates un-testable hypotheses, and may result in incorrect determinations of the ignition source and first fuel ignited. Any hypothesis formulated for the causal factors (e.g., first fuel, ignition source, and ignition sequence), must be based on facts. Those facts are derived from evidence, observations, calculations, experiments, and the laws of science. Speculative information cannot be included in the analysis.

The reaction to this paragraph was two-fold. The first interpretation assumed the 921 committee was stating that the process of elimination was bad. The second

response was that no one would ever be able to make an arson case again. Many in the fire investigation community were outraged. Neither of these two reactions was actually valid based on what the paragraph and the fire cause chapter as a whole actually said. Nowhere in the paragraph did the committee say that the process of elimination is a bad thing that should not be used. The point the committee was trying to make, although not as effectively and artfully as needed, was that if the process of elimination was not used properly, it could lead to conclusions that could not be supported by the scientific method. The committee believed the process of elimination was an integral part of the scientific method, but was not able to communicate this articulately in the 2011 edition.

The revisions in the 2014 edition very clearly addressed this issue. The other point causing concern was that because “NFPA 921 said you couldn’t use Process of Elimination,” no one would be able to make a charge of arson. Two things seemed to get lost in this very emotionally-charged discussion. The first was that this section was under “18.6 Testing the Cause Hypothesis.” Notice that the opening sentences of this section state:

**18.6 Testing the Cause Hypothesis.** Each of the alternate hypotheses that were developed must then be tested using the Scientific Method. If one remaining *hypothesis* is tested using the “scientific method” and is determined to be probable, then the cause of the fire is identified.

All alternate hypotheses are required to be tested using the scientific method, not just the ones that are eliminated. The final hypothesis must also be tested. The “Methodology Chapter” of NFPA 921 addresses the concept of testing a hypothesis. Section 4.3.6 states in part:

**4.3.6\* Test the Hypothesis (Deductive Reasoning).** The investigator does not have a valid hypothesis unless it can stand the test of careful and serious challenge. Testing of the hypothesis is done by the principle of deductive reasoning, in which the investigator compares his or her hypothesis to all the known facts as well as the body of scien-

tific knowledge associated with the phenomena relevant to the specific incident.

So, if the investigator is claiming a fire cause for which there is no evidence or proof of its existence, then the investigator is using “negative corpus.” A negative corpus methodology cannot be tested using the scientific method because there is no evidence by which the hypothesis can be challenged or tested. (By default, that hypothesis would not be valid. If there is no data to support its existence, then there is no data to collect. Therefore, there is no data to analyze. Consequently, if there is no data to analyze, there is no hypothesis to develop or test.) Without any evidence to support the cause being proposed, the entire scientific method falls apart.

With all of the debate and discussion over the negative corpus paragraph in the 2011 Edition of NFPA 921, the Technical Committee went back to work, attempting to clarify the intent of the section. New language was added to the beginning of the paragraph and the title of the section changed. The beginning of the paragraph now reads:

**19.6.5\* Appropriate Use.** The process of elimination is an integral part of the scientific method. Alternative hypotheses should be considered and challenged against the facts. Elimination of a testable hypothesis by disproving the hypothesis with reliable evidence is a fundamental part of the scientific method. However, the process of elimination can be used inappropriately.

The committee was concerned about the misuse of the process of elimination and these new opening statements make the committee’s view of the process of elimination clear. It was the misuse of the Process of Elimination that the Committee was concerned about, not its proper use. However, the emphasis on evidence supporting the hypothesis remains. Regardless of a fire’s cause, the investigator must have supporting evidence by which the hypothesis can be seriously challenged. It is not enough to just eliminate other hypotheses. For example, you cannot say, “I eliminated everything else; therefore, the fire cause is arson.” The final hypothesis must be tested against the facts. A very important question must be

answered: “What is the proof for my cause determination?”

In fire investigation, one has to remember, origin first. This concept is spelled out in NFPA 921. The introduction to the origin chapter emphasizes:

The origin of a fire is one of the most important hypotheses that an inves-

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tigator develops and tests during the investigation. Generally, if the origin cannot be determined, the cause cannot be determined, and generally, if the correct origin is not identified, the subsequent cause determination will also be incorrect.

The correct origin determination establishes the boundaries for potential ignition sources. Once the origin is determined, a search for evidence of potential ignition sources within that origin area is conducted. It is the evidence of potential ignition sources that allows an investigator to develop the hypothesis for the fire cause that must be considered and tested. The question that often comes up is: what is the evidence? The Technical Committee intentionally used the word “evidence” and not “physical evidence” in that section. If there is a fire on a kitchen counter, the evidence that makes the coffee maker, blender, and toaster potential ignition sources for the fire is their physical presence. If you believe the fire is the result of a human act, the question to be answered is: “What evidence do you have that makes a human act a potential ignition source that should be considered?” Maybe it is a witness that saw someone do something. Maybe it is multiple, unconnected areas of origin. Maybe there are positive sam-

ples for gasoline in areas where it logically should not be.

Evidence can take several forms. Pursuant to 921, the investigator must have evidence to point to that supports the cause determination. In the aforementioned kitchen counter scenario, if the investigator eliminates the toaster and blender, would that mean the coffee maker is the cause of the fire, even without examining it? In the negative corpus world, examining the coffee maker would be unnecessary because everything else was eliminated. What happens if examination of the coffee maker reveals no evidence of failure with it either?

A good analogy involving a medical examiner (M.E.) has been used during industry discussion. The M.E. examines the body but is unable to identify an accidental cause of death. So what does he list as the cause of death? In a negative corpus world, because the M.E. eliminated any accidental causes, the cause of death would be listed as homicide. Certainly, this type of skewed deduction would be dangerous and is not employed in practice.

There are a couple of other sections in the cause chapter that the investigator should know and understand. They shed some light on this subject as well.

**19.1.3 Ignition Source.** The ignition source will be at or near the point of origin at the time of ignition, although in some circumstances, such as the ignition of flammable vapors, the two may not appear to coincide. Sometimes the source of ignition will remain at the point of origin in recognizable form, whereas other times the source may be altered, destroyed, consumed, moved, or removed. Nevertheless, the source should be identified in order for the cause to be proven. There are, however, occasions when there is no physical evidence of the ignition source, but an ignition sequence can be hypothesized based on other data.

**19.4.4.3** There are times when there is no physical evidence of the ignition source found at the origin, but where an ignition sequence can logically be inferred using other data. Any determination of fire cause should be based on evidence rather than on the absence of evidence; however, there are limited

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circumstances when the ignition source cannot be identified, but the ignition sequence can logically be inferred. This inference may be arrived at through the testing of alternate hypotheses involving potential ignition sequences, provided that the conclusion regarding the remaining ignition sequence is consistent with all known facts (see Basic Methodology chapter).

Both of these sections stress that there will be times when no physical evidence of the ignition source is found; however, “other data” can be used to develop a hypothesis. Notice that there are “limited circumstances” in which investigators can make this inference. One of those limiting factors will be the amount of damage. In previous editions of 921, “clearly defined” origin area was used to identify circumstances when a hypothesis concerning cause could be made without having physical evidence. The problem with “clearly defined” was that the Technical Committee did not clearly define what the phrase meant. The committee was attempting to say that if the damage was so minimal, a fire investigator would not be needed to establish the origin. Anyone could walk in and point to where the fire originated. Some investigators were taking that “clearly defined” origin to mean that as long as the origin was clearly defined to them, it was okay. So, this “clearly defined” idea was being applied to compartments that had gone to flashover and there was severe damage throughout. Due to the misunderstanding and misapplication of the phrase, it was removed.

Recent court cases have resulted in some interesting decisions. In the *Somnis v. Country Mutual Insurance* case in Minnesota, a *Daubert* challenge was made against a fire investigator. The fire investigator had eliminated potential accidental fire causes. Based on the elimination of accidental fire causes, the expert concluded that that it was an incendiary fire. The plaintiff argued in the motion to exclude that the expert’s testimony would be unreliable and in violation of the *Daubert* decision. Allowing the expert to testify to an incendiary fire because other causes had been eliminated would lead the jury to speculate on the cause of the fire. The state court rejected the argument to exclude

the expert from testifying completely. The court limited the expert’s testimony and allowed the expert to testify to all of the accidental fire causes that were eliminated, but would not allow testimony that the ultimate fire cause was therefore incendiary.

The court allowed Country Mutual to present circumstantial evidence from

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Rather, it is the jury’s place to make an inference that an incendiary fire may have occurred given all facts of the case, including expert testimony that all reasonable accidental causes had been examined and excluded.

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which the jury might conclude the fire cause was incendiary; however, the expert could not offer that opinion. The court found no principled basis to exclude the investigator’s testimony on the elimination of accidental causes for the fire. However, the court did find that the investigator’s opinion that the fire was therefore incendiary should be excluded because an expert who simply “draws inferences or reaches conclusions within the jury’s competence” does not provide “helpful” testimony under Federal Rules of Evidence, Rule 702. Rather, it is the jury’s place to make an inference that an incendiary fire may have occurred given all facts of the case, including expert testimony that all reasonable accidental causes had been examined and excluded.

In the 2007 criminal trial of *State of Wisconsin v. Joseph Awe*, Mr. Awe was convicted of arson in a 2006 fire to his bar. In 2013, after serving nearly his entire sentence, the conviction was vacated and a new trial was granted. The county circuit judge granted a new trial because the public

investigator in the case had used negative corpus to conclude that the fire must have been incendiary because no accidental fire cause could be found. In the time between Mr. Awe’s conviction and the successful appeal, NFPA 921 was revised to indicate that negative corpus should not be used to reach a conclusion. Mr. Awe included in his appeal that there was “newly discovered evidence which to a reasonable probability would have caused a jury to have a reasonable doubt as to his guilt.” The judge’s order specifically cited “a maturing development in the arson field that would bury the negative corpus approach” from NFPA 921 (2011 edition) Section 18.6.5 as the “new evidence” upon which the new trial was ordered. The judge went on to say that had the 2011 edition of NFPA 921 existed at the time of the original trial, it would have been used to impeach the state’s expert witness who used a now-unapproved method to reach the conclusion of an incendiary fire cause. It is interesting that in this case, the judge applied new developments in the NFPA 921 to an older case. At the time of the original investigation, the 2004 edition would have been in effect.

The real answer to the original question, “Is it arson?” yields additional questions. What evidence do you have to support a hypothesis that the fire cause was incendiary? Can your incendiary fire cause hypothesis withstand the test of careful and serious challenge, as required by the scientific method? It is not enough to simply cite what was eliminated as the basis for determination. The investigator needs to be able to point to evidence that supports the hypothesis of an incendiary fire cause, to the exclusion of other potential causes. The legal chapter lays out three general types of evidence: demonstrative, documentary, and testimonial. Each is discussed in individual subsections. All three are appropriate to be used in the determination of the cause of a fire.

The incendiary fires chapter expands the discussion on evidence by providing some insights on “conditions related to fire origin and spread that may provide physical evidence of an incendiary fire cause.” Section 24.2 has seven subsections of evidence. Those general subsections are:

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- Multiple Fires
- Trailers
- Lack of Expected Fuel Load or Ignition Sources
- Exotic Accelerants
- Unusual Fuel Load or Configuration
- Burn Injuries
- Incendiary Devices
- Assessment of Fire Growth and Fire Damage

Each of these *may* provide the investigator with physical evidence of an incendiary fire cause. In addition to these conditions that may provide physical evidence of an incendiary fire cause, section 24.3 provides “Potential Indicators Not Directly Related to Combustion.” The indicators discussed in this section are not directly related to the fire cause; however, they may be used to develop ignition hypotheses, select witnesses to interview, develop suspects, and develop avenues for further investigation. “The indicators in this section are those that tend to show that somebody had prior knowledge of the fire.” Section 24.3 has six subsections discussing the following indicators:

- Remote locations with blocked or obscured view
- Fires near service equipment and appliances
- Removal or replacement of contents prior to the fire
- Blocked or obstructed entry
- Sabotage to the structure or fire protection systems
- Open windows and exterior doors.

While none of the above indicators are directly related to the origin or cause of the fire, they *may* provide the investigator with data that requires further investigation. However, the investigator should be cautioned not to let one of these “potential indicators not directly related to combustion” be the deciding factor on the actual cause of the fire.

## Conclusion

Any time a fire investigator is making a determination as to the fire cause, whether it is incendiary or not, the investigator must first establish the origin. Once the origin is established, then the investigator can begin evaluating potential ignition sources and causes for the fire. Regardless

of the cause determination, the investigator needs to have evidence that will support the final hypothesis as to fire cause, to the exclusion of all other alternate hypotheses. That is the only way the cause determination will withstand the scrutiny of the scientific method. So, is it arson? Only if the investigator has evidence to prove it is. 