Fire Investigation 101

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A little about me

Donan – Seven years
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Regional Fire Manager for the Southern Region
(GA, FL, TN, AL, MS, AR, LA, TX, OK)

Firefighter / Paramedic  26 years (Public Sector)

Certified Fire Officer One – State of Florida

Extensive Background in Education of Firefighters and Law Enforcement Officers

Public Educator

East Tennessee Transplant
Fire is rapid self-sustaining oxidation accompanied by heat and light of varying intensities.
The Fire Tetrahedron

- Heat
- Oxidizing Agent
- Reducing Agent (Fuel)
- Chemical Chain Reaction

Reducing Agent (Fuel)
Oxidizing Agent
Chemical Chain Reaction
Heat
Heat + Fuel + Oxygen

PARTY PARTY PARTY
Heat + Fuel + Oxygen

+ A trip to Gatlinburg

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PARTY PARTY PARTY
FUEL SOURCES

Only Gases Burn

Solid Matter + Pyrolysis = Fuel Gas

Liquid Matter + Vaporization = Fuel Gas

Gaseous Matter = Fuel Gas
3.3.134  Pyrolysis.
A process in which material is decomposed, or broken down, into simpler molecular compounds by the effects of heat alone; pyrolysis often precedes combustion.
19.3.1 Identify Fuels in the Area of Origin.

The investigator should identify the fuels present in the area of origin at the time of ignition. One of these fuels will be the first fuel ignited. The type, quantity, and specific location of structural and content fuels should be identified.

19.1.2 First Fuel Ignited.

The first fuel ignited is that which first sustains combustion beyond the ignition source. For example, the wood of the match would not be the first fuel ignited, but paper, ignitable liquid, or draperies would be, if the match were used to ignite them.

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.

18.6.5* Inappropriate Use of the Process of Elimination.

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.

• **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 process of 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 supporting evidence of its existence, is referred to by some investigators as *negative corpus*.

The ignition source will be at or near the point of origin at the time of ignition.

Our Job =
Evaluate the area of origin and eliminate or define each potential ignition source as no cause or a cause of the fire.
19.3.1 Identify Fuels in the Area of Origin.

19.3.1.1 ...The initial fuel must be capable of being ignited within the limitations of the ignition source. The components in most buildings are not susceptible to ignition by heat sources having low energy, low temperature, or short duration. For example, flooring, structural lumber, wood cabinets, and carpeting do not ignite unless they are exposed to a substantial heat source.

19.3.5 Identify Ignition Sequence Data.

The investigator should develop data that can be used to analyze the events that brought the fuel and ignition source together (ignition sequence).
Chapter 21 Analyzing the Incident for Cause and Responsibility

21.1* General.

21.1.1 The purpose of fire and explosion investigations is often much broader than just determining the cause of a fire or explosion incident. The goal of any particular fire investigation is to come to a correct conclusion about the features of a particular fire or explosion incident that resulted in death, injury, damage, or other unwanted outcome. The features can be grouped under the following four headings:

21.1.1 (1)

The cause of the fire or explosion. This feature involves a consideration of the circumstances, conditions, or agencies that bring together a fuel, ignition source, and oxidizer (such as air or oxygen), resulting in a fire or a combustion explosion.

21.1.1 (2)

The cause of damage to property resulting from the incident. This feature involves a consideration of those factors that were responsible for the spread of the fire and for the extent of the loss, including the adequacy of fire protection, the sufficiency of building construction, and the contribution of any products to flame spread and to smoke propagation.

21.1.1 (3)

*The cause of bodily injury or loss of life.* This feature addresses life safety components such as the adequacy of alarm systems, sufficiency of means of egress or in-place protective confinement, the role of materials that emit toxic by-products that endanger human life, and the reason for fire fighter injuries or fatalities.

21.1.1 (4)

The degree to which human fault contributed to any one or more of the causal issues described in (1), (2), and (3).

This feature deals with the human factor in the cause or spread of fire or in bodily injury and loss of life. It encompasses acts and omissions that contribute to a loss (responsibility), such as incendiarism and negligence.

21.5 Determining Responsibility.

After determining the origin, cause, and development of a fire or explosion incident, the fire investigator may be required to do a failure analysis and to determine responsibility. It is only through the determination of such responsibility for the fire that remedial codes and standards, fire safety, or civil or criminal litigation actions can be undertaken.

21.5.1 Nature of Responsibility.

The nature of responsibility in a fire or explosion incident may be in the form of an act or omission. It may be something that was done, accidentally or intentionally, that ultimately brought about the fire or explosion, or it may be some failure to act to correct or prevent a condition that caused the incident, fire/smoke spread, injuries, or damage. Responsibility may be attributed to a fire or explosion event notwithstanding the classification of the fire cause: natural, accidental, incendiary, or undetermined. Responsibility may be attributed to the accountable person or other entity because of negligence, reckless conduct, product liability, arson, violations of codes or standards, or other means.

24.4.9.1.1 Motive.

An inner drive or impulse that is the cause, reason, or incentive that induces or prompts a specific behavior.

24.4.9.2 Intent

The purposefulness or deliberateness of the person’s actions or, in some instances, omissions.

The showing of intent generally means that some substantive steps have been taken in perpetuating the act.

The National Center for the Analysis of Violent Crime (NCAVC) has identified the six motive classifications as the most effective in identifying offender characteristics for fire-setting behavior, as follows:

- Vandalism
- Excitement
- Revenge
- Crime concealment
- Profit
- Extremism
Definition of SUBROGATION

: the act of subrogating; specifically: the assumption by a third party (as a second creditor or an insurance company) of another’s legal right to collect a debt or damages

First Known Use of SUBROGATION

15th Century

Source – Merriam-Webster  www.merriam-webster.com
Successful fire subrogation first requires a successful O & C investigation!
The Scientific Method - NFPA 921 2011 Edition
Guide for Fire and Explosion Investigations

Recognize the need (identify the problem)

Define the problem

Collect data

Analyze the data

Develop a hypothesis (inductive reasoning)

Test the hypothesis (deductive reasoning)

Select the final hypothesis
• Just because a recalled appliance or other item was present in the area of origin does not prove the recalled appliance or item actually caused the fire.
  – Avoid making “assumptions” by always using the scientific method.
    • Avoids expense, and embarrassment.

• Case study #1
20.1.1 Accidental Fire Cause.
Accidental fires involve all those for which the proven cause does not involve an intentional human act to ignite or spread fire into an area where the fire should not be.

20.1.2 Natural Fire Cause.
Natural fire causes involve fires caused without direct human intervention or action, such as fires resulting from lightning, earthquake, and wind.

20.1.3 Incendiary Fire Cause.

- An incendiary fire is a fire that is deliberately set with the intent to cause a fire to occur in an area where the fire should not be.

20.1.4 Undetermined Fire Cause.

Whenever the cause cannot be proven to an acceptable level of certainty, the proper classification is undetermined as follows:

(A) Undetermined fire causes include those fires that have not yet been investigated or those that have been investigated, or are under investigation, and have insufficient information to classify further. However, the fire might still be under investigation and the cause may be determined later with the introduction or discovery of new information.

20.1.4 Undetermined Fire Cause.

Whenever the cause cannot be proven to an acceptable level of certainty, the proper classification is undetermined as follows:

(B) In the instance in which the investigator fails to identify the ignition source, the fire need not always be classified as undetermined. If the evidence established one factor, such as the use of an accelerant, that evidence may be sufficient to establish an incendiary fire cause classification even where other factors such as ignition source cannot be identified.