

**Analysis of the Fire
at the Dr. E.K. Whitley, Jr. Residence
on March 15, 2005**

By



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31 May 2012

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This report evaluates the origin and cause of the fire of at the Dr. E. K. Whitley residence on March 15, 2005. The author's Curriculum Vitae, List of Publications and Rule 26 disclosure are given as Appendix A. Materials reviewed are listed in Appendix B.

The analysis and opinions expressed in this report are based on the author's knowledge of facts and information to date. If additional information becomes available which has a bearing on these opinions as expressed below, these opinions will be amended or supplemented appropriately.

THE FIRE INCIDENT

The fire was reported at 1017 am on Tuesday 15 March 2005 (911 report). The Jaeger volunteer fire department arrived on scene at 1027 am and observed smoke showing on arrival. The residence was a two story wood frame with brick veneer. On arrival Chief Hare had a two man team (John Shrader and Bobby Blankenship) enter the structure via the front door. They observed a couch burning vigorously in the first floor living room and directed their hose stream onto the couch, knocking the fire down. They then moved to the second floor and moved into the master bedroom. There they found Dr. Whitley on the floor at the side of the bed (opposite side from hole in the floor). They moved him to the doorway of the bedroom. They recognized that he had already expired. Water was applied to the bedroom via a hose line at the window, which was accessed via a ladder. The firefighters observed that the bed was fully consumed at the time of their attack and was no longer burning. The fire was under control within ten minutes of the start of firefighting operations.

PUBLIC SECTOR FIRE INVESTIGATION

The fire was investigated by The West Virginia Fire Marshal's Office with Assistant Fire Marshal (AFM) Bailey leading the investigation with assistance from AFM Domingo, Ritchie and Gianato. Approximately 100 photos were taken of the fire scene and 15 diagrams were prepared to

illustrate the building and contents layout, as well as documenting the location of photographs taken. AFM Bailey's report indicates that fires originated in the living room and the master bedroom. The primary damage in the living room was to the couch and the adjacent coffee table, the fireplace mantle, and the ceiling above. The primary damage in the master bedroom was to the bed, a table, the hardwood floor and the ceiling above.

There was a hole in the ceiling of the living room and a hole in the floor of the master bedroom. AFM Bailey noted that these holes were somewhat offset from the couch and coffee table that he opined was the area of origin of the fire in that room. His report indicated that the electrical circuits in the ceiling of the living room were examined and eliminated, though no basis for the elimination was reported. The report did not reference the autopsy, did not note that samples were collected for analysis for ignitable liquids, and did not report if circuit breakers had operated. The report notes also that the TV in the master bedroom was found face down on the floor with thermal damage primarily on the back of the unit and smoke deposits on the shelf where the TV would normally be located, indicating to AFM Bailey that the TV was knocked over before the fire.

AFM Bailey determined that there were two fire origins, one in the living room and one in the master bedroom. He opined that the two fires were incendiary.

According to the WV State Forensic Laboratory report, AFM Bailey submitted a total of twelve samples from the master bedroom and the living room. The report indicates that one sample from the master bedroom was positive for miscellaneous ignitable liquid in the light range. Toluene was cited as an example of such an ignitable liquid, though it was not specifically identified in the spectra. The other eleven samples were negative for ignitable liquids.

The Report of Death Investigation and Post Mortem Examination Findings indicated that Dr. E.K. Whitley had died due to smoke inhalation and thermal burn injuries. Atherosclerotic coronary artery disease was a likely contributing factor to his demise. He suffered first and second degree burns over 90% of his body. He had a carboxyhemoglobin blood saturation of 31% and severe atherosclerosis.

PRIVATE SECTOR INVESTIGATION

An investigation was carried out by Raymond Griffith of Casto Investigations on behalf of the insurance company. Investigator Griffith arrived at the scene on 24 March 2005 and AFM Bailey was on scene during Griffith's scene examination.

Investigator Griffiths found the living room couch extensively burned with the arm on the west end still intact (the end opposite the hole in the ceiling). The coffee table was preferentially burned on the south side adjacent to the couch. Burn patterns were noted on the mantle area. He found the majority of the fire was in the ceiling area directly between the couch and the coffee table. There were two floor joists burned completely away in an area about six feet from the eastern wall of the building. The subfloor (of the master bedroom) was burned about 18 inches further back than the finished hardwood floor above. A wire was hanging down from a joist near the hole which went to the ceiling light in the center of the living room ceiling.

The hole in the floor of the master bedroom was about 18 inches smaller than the hole in the living room. The hospital bed was fully consumed by fire. The room had evidence that the victim was a heavy smoker and different types of ammunition were found. Two samples were taken and analyzed. Both were negative for ignitable liquid residues.

According to Investigator Griffiths report, AFM Bailey had collected the ceiling light from the living room. Investigator Griffiths examined the light and other wiring in the area and found an electrical short (arcing) on those wires. A single circuit breaker was found to have been tripped, but the circuit was not identified. Investigator Griffiths could not determine if the short was the cause of the fire or a result of fire exposure.

Investigator Griffiths report placed the area of origin as within the floor/ceiling assembly between the living room and master bedroom. Investigator Griffiths classified the cause of the fire as undetermined. He was aware of the public sector findings, as the public sector report was appended to his report. The SFM was provided a copy of Investigator Griffith's report.

TRIAL TESTIMONY CONCERNING FIRE ORIGIN AND CAUSE

Relatively few witnesses were directly related to the origin and cause of the fire. Notable witnesses to be discussed here include Tim Butler (passed by home at 8 am), the fire marshals, Investigator Griffith, FF John Schrader, forensic analyst Karen Powers, and Medical Examiner Dr. Mahmoud.

From testimony of family and friends, Dr. Whitley was not mobile and had not been staying at the residence. The day before the fire he moved back into this residence with assistance. He was in bed and alone after 9 pm. There was no operating phone and no operating smoke alarm.

Around 8:15 am Mr. Butler drove by the residence and saw dogs wagging their tails in the yard, the front door open, and an unidentified individual walking inside the home on the first floor. He reported no signs of fire at that time. The individual was never identified.

At the time that the fire was discovered, no one had yet come to the residence to assist Dr. Whitley get up. Dr. Whitley's clinic was informed of the fire via phone and staff came over to the adjacent residence where Dr. Whitley was in bed. The front door was unlocked and opened, but no one entered due to the smoke levels.

FF John Schrader provided his observations and actions in entering and controlling the fire. He testified that the front door was opened by a civilian just before fire department arrival. He was the first to enter the building. He saw an orange glow in the living room and he used his hand line to knock down the flames on the couch. The flames initially extended to the ceiling. After knocking down the living room couch fire, he moved to the second floor. He found the bedroom door open a few inches and upon entering the bedroom he saw a little bit of orange glow where stuff was still burning and he saw Dr. Whitley's feet where he was laying on the floor next to the bed. He pulled the Doctor along the floor toward the door. As he reached the door, the fire was attacked via an exterior stream at the window. They had broken out the window and sprayed water into the room to control the fire. He saw the partially melted TV on the floor and the scooter was not next to the bed. He also noted that when he arrived at the bed to rescue Dr. Whitley, the bed was fully consumed and no longer burning. He noted that the hole in

the floor was almost on top of the couch in the living room. He observed that it appeared that the fire had spread up from below.

James Gianato, the Director of the State Division on Homeland Security and Emergency Management Operation System, was present at the 911 Center at the time of the call and provided information about the calls and dispatch. He traveled to the fire scene and arrived after the fire was controlled. He identified that the fire department had laddered the building and broken out several windows. He told the jury about the hole in Dr. Whitley's bedroom floor and the TV that was found face down on the floor of the bedroom. He opined that the hole in the floor was not normal in an accidental fire. He opined that Dr. Whitley's burn injuries were inconsistent with a fire started by smoking in bed. He opined that any type of flammable liquid could have caused the hole in the bedroom floor.

SFM investigators identified that most of the fire damage to the living room was to the couch and the coffee table. They identified the ceiling above the coffee table as basically gone, burnt through to the bedroom above. In the bedroom, they identified flame damage to the bed and a hole burnt in the floor to the living room below. They identified the TV as facing down on the floor and partially melted. They identified that the melting was primarily on the back of the TV, indicating the melting occurred while the TV was on the floor. They also noted soot deposition on the entertainment center where the TV would normally be, indicating it was not protected at the time the room was smoky. They opined that the hole in the floor was an area of origin, based upon the wall and ceiling damage at that location. They reported having examined the wiring in the living room ceiling. They found that the hole was not centered on the ceiling joists that contained the wiring and apparently eliminated the wiring as the cause of the fire on this basis. They reported that the primary electrical investigation was performed by the late AFM Ritchie. The wiring and junction box were retained by the SFM office. They identified that two circuit breakers had operated, but did not report which circuits were involved. They opined that there were two areas of fire origin, the couch in the living room and on the floor to the left of the bed in Dr. Whitley's bedroom. They reported that of the 12 samples provided to the laboratory for analysis of ignitable liquids, one was found to contain toluene, a chemical they were not used to seeing in sample analysis results. They opined that the fire was incendiary. They opined that there

is an accidental or natural cause for a fire to occur and burn as this did. They ruled out evidence as the cause of the fire. Their determination of the origin was based upon the extent of burn damage in the respective areas. They discounted the couch and coffee table ignition by drop down burning from the ceiling based upon the offset of the ceiling hole from the couch of several feet. Upon questioning, AFM Bailey did not acknowledge that debris could move horizontally upon impact with the floor. In the end, he opined that there were two origins and each was intentionally set.

Investigator Raymond Griffith also identified the living room couch and the bed as the primary items consumed by fire. He examined the floor/ceiling assembly between the living room and the bedroom and found that the subfloor was burned away over an area 18 inches larger than the bedroom floor. He identified electrical activity in the wiring in the floor/ceiling assembly. He could not determine if the electrical activity caused the fire or if it was the result of the fire. He found the floor/ceiling assembly to be the origin of the fire and he found the cause of the fire to be undetermined.

Dr. Mahmoud described Dr. Whitley's burns as first and second degree burns over much of his body, and did not observe any recent injuries. He described the burns as not consistent with direct flame contact. He determined that Dr. Whitley was alive at the time of the fire based on soot in his respiratory system and his 31% COHb, which indicated he had breathed smoke and carbon monoxide. He found therapeutic levels of prescription medication. His finding was that Dr. Whitley died due to carbon monoxide inhalation and thermal injuries as a result of the fire, with his coronary artery disease as a contributing factor. His examination and analysis did not speak to whether the fire was intentional or not.

Koren Powers reported to the jury that of the 12 samples she analyzed for ignitable liquids, 11 were negative. The single positive was classified as a miscellaneous ignitable liquid. In her report toluene was identified as an example of such a liquid. In her testimony, she indicated that toluene was specifically found in the spectra. No spectra were included with her report, so there is no way to identify how and why the differences between her report and testimony arose.

ANALYSIS

The standard of care for fire investigations is NFPA 921 (NFPA 2008, Lentini 2007). The methodology for fire investigation is an application of the scientific method as outlined in NFPA 921. In this methodology data is collected, hypotheses are formulated, and a conclusion is reached if and only if a single hypothesis is consistent with the case facts and our knowledge of fire science. The determination of the origin of a fire is first made using the scientific method (Chapter 17 NFPA 921). Subsequently, all cause hypotheses within the area of origin are formulated and the hypothesis testing process follows (Chapter 18 NFPA 921). A determination of the cause can be made if and only if a single cause hypothesis survives the testing process. The determination of the cause of a fire requires the identification of those materials, circumstances, and factors that were necessary for the fire to occur. This includes identification of the source of ignition, the first material ignited, and the ignition sequence.

The SFM investigators found that the fire was incendiary with two distinct origins. The living room fire was opined to have been started by an open flame applied to the couch, and the bedroom fire was opined to originate at the floor next to the bed where they opine a liquid containing toluene was poured and ignited. This contrasts with Investigator Griffiths, who found the origin to be the floor/ceiling assembly and cause to be undetermined.

Investigator Griffith could not eliminate the electrical activity in the floor/ceiling assembly as a cause of the fire. The SFM eliminated it because it was not central to the damage area. This elimination was inappropriate. It is well known that the direction of fire travel is strongly affected by many factors, including access to air. Since the damage to the floor/ceiling assembly was severe, there is no way to exclude air access as the means to explain fire spread to the area of greatest damage from a fire initiation by electrical activity (arcing). Under NFPA 921, this hypothesis cannot be eliminated as the cause of the fire.

Beyond this, the hypothesis of two fire origins put forth by the SFM is not consistent with the case facts. The SFM opined that the hole in the bedroom floor was created by pouring an ignitable liquid onto the floor. Research has shown that pouring an ignitable liquid onto a wood floor results in very little thermal damage to the floor with only superficial discolorization and localized thin char formation (Putorti et al (2001)). This contrasts markedly with the SFM understanding that the fire was burning through the hardwood floor, through the subflooring, and into the floor/ceiling

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assembly. Further, as NFPA 921 indicates (Section 6.3.5.2), the nature of the burn patterns at the bedroom floor hole are consistent with the fire spreading upward, and not downward. The subfloor was consumed over a greater area than the hardwood floor above. This is consistent with the floor being attacked and consumed by fire below the floor. This was recognized by FF Shrader and Investigator Griffith. AFM Bailey opined that the fire in the living room could not have started due to drop down of burning materials from above. He relied upon the fact that the center of the hole in the bedroom floor was offset from the couch by several feet. This of course ignores the fact that the drop down of burning debris was possible over the entire area of damage within the floor/ceiling assembly, not just the center of the hole to the room above. Further, it ignores the fact that once debris from above hits the floor, the material can move along the floor and burnt embers can be propelled in all directions along the floor due to the impact. All that is required for ignition of the couch is contact with a small flaming piece of wood or ember. His argument has no merit and ignition of the couch by drop down burning cannot be eliminated as the means by which the couch was ignited.

The observations of FF Shrader are significant. He found the couch in the living room still burning vigorous. Since a flaming couch fire duration is about 10 minutes (Sundstrom (1999), Krasney et al (2001)), this puts the ignition of the couch around the time that the fire was reported. At the same time, FF Shrader found that the bed was fully consumed and well within the decay phase of burning, indicating that the bed had ignited well before the couch in the living room. Neither the couch fire, nor a flammable liquid spill/bed fire scenario can explain the severe damage to the floor/ceiling assembly. The couch fire is not capable of penetrating the plaster ceiling and causing the extensive burning of wood joists in the floor/ceiling assembly. Plaster on wood lath has a face rating of 15 minutes (HUD (2000)), indicating that the plaster will protect the underlying wood structure for 15 minutes in the standard fire test exposure. The fire in the bedroom is not capable of penetrating the hardwood floor and subfloor. Charring rates through wood with flame exposure are generally in the range of 0.3-1.2 mm/min, with 0.6 mm/min being the recognized average (Drysdale 2011, Frisquin 2011). The time required to fully consume the wood joists is expected to be measured in hours. The damage to the floor/ceiling assembly is not consistent with the hypothesized living room and bedroom fire starts.

The SFM hypothesized that the bedroom fire was started with an accelerant poured onto the floor of the bedroom at the location of the hole. This was based upon the presence of toluene in a sample obtained on the bedroom floor. The investigators were never able to identify what liquid product could have been used to start the fire, but at the same time acknowledged that toluene is present in many household products. They did no work to determine what the product was and what products may have been present in the room before the fire. In short they could not identify the accelerant and could not establish that the liquid was a foreign material brought to the room for the purpose of starting a fire. NFPA 921 requires that the material first ignited be identified as part of the cause determination. The hypothesis of two incendiary fire starts is not consistent with the physical evidence and the eyewitness observations. As such, under NFPA 921 the hypothesis is eliminated as a potential fire cause.

The SFM investigators correctly eliminated smoking in bed as the cause of the fire. The physical evidence and eyewitness observations are not consistent with this hypothesis.

Investigator Griffith's report has only a single hypothesis for the cause of the fire, an electrical fire initiated within the floor/ceiling assembly. His report does not even mention any incendiary fire cause hypothesis, even though he was aware of the SFM findings and report. He found no basis for eliminating his electrical cause hypothesis. Under NFPA 921, when one and only one cause hypothesis survives the testing process, it can be taken to be the cause of the fire. Nonetheless, Investigator Griffith opined that the fire originated in the floor/ceiling assembly and that the cause of the fire was undetermined. Based upon the NFPA 921 methodology and the record of his investigation and its findings, the cause should have been listed as electrical.

CONCLUSIONS

In this fire incident three potential cause hypotheses were developed: 1) two incendiary fires, one involving the ignition of the couch in the living room by an open flame, and the second involving an ignitable liquid pour onto the floor adjacent to the bed upstairs, 2) smoking in bed, and 3) an electrical fire within the floor/ceiling assembly. Of these, only the electrical fire within the floor/ceiling assembly survives NFPA 921 hypothesis testing. Under NFPA 921, this fire cannot be determined to be incendiary.

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APPENDIX A

CRAIG L. BEYLER, Ph.D., Technical Director

EDUCATION:

Ph.D. in Engineering Science, Harvard University, 1983
M.S. in Mechanical Engineering, Cornell University, 1980
M.Sc. in Fire Safety Engineering, University of Edinburgh, 1978
B.S. in Fire Protection Engineering, University of Maryland, 1976
B.S. in Civil Engineering, Cornell University, 1975

PROFESSIONAL EXPERIENCE:

Technical Director, Hughes Associates, Inc., 1990–present. Responsible for technical quality of fire protection design, research, and development projects and professional development of engineering staff. Forensic fire analysis. Project manager for a variety of fire protection R&D/T&E programs. Development and use of analytical methods in fire dynamics, fire chemistry, fire detection, fire suppression, smoke and heat venting. Development of mathematical fire models and modeling techniques for specialized applications, including zone and field models. Risk and hazard analysis for a wide range of specialized applications.

Principal, Fire Science Technologies, 1987–1990. Development of compartment fire models including computer-based models and simple correlationally based models for ships and buildings. Preparation and presentation of a five-day short course for the HAZARD I hazard analysis package. Litigation support for a range of fire situations.

Assistant Professor of Fire Protection Engineering and Mechanical Engineering, Worcester Polytechnic Institute, 1985–1987. Taught graduate courses in Combustion, Fire Dynamics, and Fire Chemistry. Advised MS thesis work for FPE graduate students. Research in fire dynamics including compartment fire growth, smoke movement, pool fire radiation as well as fault tree approaches to link fire growth predictions to performance based fire safety objectives. Chaired a committee to totally restructure the graduate courses in the FPE degree programs and instituted an ongoing seminar program.

Visiting Scientist, Fire Research Station at Borehamwood, England, 1984–1985. Conducted experimental and theoretical investigations of piloted ignition of solid fuels. Prepared a review paper of the state-of-the-art of knowledge of plume and ceiling jet flows.

Postdoctoral Fellow, Harvard University, 1983–1984. Conducted an extensive experimental program to study the effect of oxygen starvation effects on the generation of products of combustion, especially carbon monoxide, in a compartment fire environment. Experimental and theoretical studies of hot layer ignition in compartment fires.

Research Associate, Department of Fire Protection Engineering, University of Maryland, 1976–1977.

Engineer (part-time), Center for Fire Research, National Bureau of Standards, 1975–1976.

Security Clearance: DOD Top Secret
DOE "Q" (inactive)

PROFESSIONAL STANDING:Committees, Boards, and Panels:*International Association for Fire Safety Science*

Chairman, International Association for Fire Safety Science, 2005–2011

Vice Chair, International Association for Fire Safety Science, 2002–2005

Program Committee Chair, International Association for Fire Safety Science–8th International Symposium, 2003–2005Program Committee, International Association for Fire Safety Science–7th International Symposium, 2001–2002Awards Committee, International Association for Fire Safety Science–4th and 5th International Symposia*Society of Fire Protection Engineers*

Member, SFPE Technical Steering Committee, 1998–present

Chair, SFPE Task Group on Engineering Practices: Radiation from Fires, 1996–present

Chair, SFPE Task Group on Engineering Practices, 1996–1998

Member, Research Committee, Society of Fire Protection Engineers, 1988–1995

Member, Engineering Education Committee, Society of Fire Protection Engineers, 1983–1995

National Fire Protection Association

Toxicity Technical Advisory Committee, National Fire Protection Association, 2002–present

Member, Guide for Fire and Explosive Investigations, NFPA 921, 1998–2011

Task Group for NFPA 204: Guide for Smoke and Heat Venting, 1996–2010

Smoke Management Systems, National Fire Protection Association, 1996–2011

Task Group for NFPA 92B: Guide for Smoke Management in Malls, Atria, and Large Spaces, 1992–2010

Member, Contents and Furnishings Committee, National Fire Protection Association, 1992–present

Member, Subcommittee on Fire Detection Design Methods, 72 EM, National Fire Protection Association, 1983–1988

Academic Advisory Boards

Advisory Board, University of Maryland, Dept. of Fire Protection Engineering, 2003–present

Advisory Board, Worcester Polytechnic Institute, Center for Firesafety Studies, 2000–2008

Industrial Advisory Board, Oklahoma State University, Fire Protection and Safety Engineering, Technology Department, 1998–2008

Government Evaluation Boards

Panel Member, Board on Assessment of NIST Programs, National Research Council, 1999 to 2005

National Academy of Science, Committee to Identify Innovative Research Needs to Foster Improved Fire Safety in the US, 2001–2002

Society Memberships:

Member, National Fire Protection Association, 1987–present

Member, International Association for Fire Safety Science, 1985–present

Member, Society of Fire Protection Engineers, 1983–present

Member, Combustion Institute, 1980–present

Member, Salamander Honorary Fire Protection Engineering Society, 1977–present

Technical Journals and Books:Founding Editor, *Journal of Fire Protection Engineering*, 1988–1992Associate Editor, *Fire Technology*, 2009–presentMember, Editorial Advisory Board, *Fire Safety Journal*, 2004–2010Member, Editorial Advisory Board, *Journal of Fire Protection Engineering*, Society of Fire Protection Engineers, 1992–presentMember, Editorial Advisory Board, *Fire Technology*, 1984–2009

PROFESSIONAL STANDING (Continued):

Co-editor, *SFFP Handbook of Fire Protection Engineering*, 1st, 2nd and 3rd and 4th editions, 1984–2010
Reviewer, *Combustion and Flame*, *Fire Safety Journal*, *Journal of Fire Science*, *Fire and Materials*, *IAFSS International Symposia*, *Combustion Institute International Symposia*

Honors:

Rasbash Medal, Institution of Fire Engineers, 2009
Arthur B. Guise Medal, Society of Fire Protection Engineers, 2000
NASA Space Flight Awareness Award-VAB Quantity Distance WG, 2011
Harold E. Nelson Service Award, Society of Fire Protection Engineers, 2005
Fellow, Society of Fire Protection Engineers, 1999
Hat's Off Award, Society of Fire Protection Engineers, 1995
Jack Bono Engineering Communications Award, with Curt Eving and Homer Carhart, 1995
Special Commendation Award, Society of Fire Protection Engineers, 1995
Special Commendation Award, Society of Fire Protection Engineers, 1993
President's Award, Society of Fire Protection Engineers, 1990
Director's Award, Society of Fire Protection Engineers, 1989

Patents:

Multi-signature Fire Detection, Roby, R.J., Gottuk, D., Beyler, C., Patent Number 5,691,703,
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