D42 Vehicle Fires: Actualistic Investigations

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The aim of this presentation is to provide the forensic community with temperature data from automobile fires that can potentially be applied to investigations.

This presentation will impact the forensic community and/or humanity by providing and demonstrating data that can be utilized in vehicle investigations.

In 2001, approximately 400,000 residential fires were reported. Investigations of many of these fire scenes incorporated either computer fire modeling or actual fire testing. The foundation of these techniques is temperature data primarily derived through the use of thermocouples devices which record fire temperatures at specified time intervals. Such data can be interpreted and manipulated in order to generate situation specific information on the intensity and duration of a structure fire. Further, temperature data lies at the foundation of investigator interpretations of fire behavior and burn patterns. Undeniably, temperature data are crucial for fire scene reconstructions and for the calibration of fire model predictions, and of increasing importance is the role that such scientific and technical data play in the substantiation and presentation of fire scene investigations in the courtroom.

Although fires in single passenger vehicles are among the most common type of fire with greater than 300,000 reported in 2001, limited resources are available to aid in the investigation of automobile fires. Currently, thermocouple data is being collected on vehicles burned in conjunction with the National Forensic Academy, a ten week program designed to educate and expose the forensic technician to procedures for identifying, collecting and preserving evidence. Overseen by the Law Enforcement Innovation Center at The University of Tennessee, Knoxville, participants are exposed to units including blood spatter, fingerprint analysis, skeletal recovery and bombs. A four day module of the course teaches techniques for the investigation of arson scenes and fatal fires, a component of which involves the ignition of an automobile, where a thermocouple device is mounted in the interior of each vehicle prior to ignition. Temperatures are recorded until cessation of burning or sixty minutes elapses. Results demonstrate a maximum temperature in excess of 1800 degrees Fahrenheit (F) was attained in each burning scenario. Of further note, in all experimental burns, temperatures exceeded 1600 degrees F in less than two minutes. As expected, variation in duration and intensity of heating was noted, yet experimentation demonstrates it can be partially attributed to vehicle model, fuel load, and environmental conditions.

To provide experience in recognizing the impact of heat upon soft tissues, several deceased animals are placed in the vehicle before burning. Following incineration, students, under the supervision of an anthropologist, recover the specimens. The partially skeletonized remains exhibit color change and fracture patterns consistent with thermal alteration. This component of the National Forensic Academy provides a unique opportunity for students while generating a growing collection of heat-altered skeletal material of known exposure, duration and temperature.

This ongoing research involving vehicle fires will ideally provide investigators, from numerous disciplines with a foundation in recognizing, detailing, and understanding the intensity and duration of automobile fires.

Vehicle Fire Investigation, National Forensic Academy, Cremated Remains

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