

Passenger Compartment Vehicle Fires:

Incendiary or Undetermined?

Opinion by:

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The investigation of vehicle fires has always been a challenge. Vehicles contain a wide variety of fuel packages and heat sources, both in the engine, passenger compartment and chassis. As the severity of damage increases, it is sometimes not possible to differentiate between the ignition source and first fuel ignited (the cause), and non-causative heat sources and secondary fuel packages (the effect).

Time lines are often valuable in vehicle fire investigations because they allow the investigator, to a reasonable degree, to eliminate certain heat sources, such as combustion heat from the engine and mechanical heat from moving parts if, for example, the vehicle has been parked and non operational for a given period of time. Also, if the ignition switch was not energized, the portions of the electrical system that are energized through the ignition system can be eliminated (that is, if the system was properly wired and not altered).

Now, consider a fully involved fire in a passenger compartment. In the past, passenger compartments did not contain nearly the fuel load or ignition sources seen in modern vehicles. Older seats were cotton batted with cloth upholstery and dashboards were often painted metal or had minimal plastic material. The headliners may have been a cardboard-type fiberboard or minimally upholstered finish. For the most part, there were no electrical components beyond the dashboard. In modern vehicles, the fuel load in the passenger compartment is significantly higher, with mostly synthetic materials.

The modern vehicle passenger compartment has many electrical sources in the dashboard, seats, doors, headliner, and floorboard. The firewall, or separation between the engine compartment and passenger compartment, has become perforated with openings to allow the flow of cables, wires and components not seen on older vehicles. This introduces more ignition sources into the passenger compartment and creates a convenient path for fire spread from the engine compartment to the passenger compartment. In a fully involved vehicle fire it can be difficult to tell if the fire went from the engine to the passenger compartment, or the opposite direction.

When faced with a fully involved passenger compartment fire, the determination of cause can be a dirty job. A careful examination of the indicators and the elimination of other potential causes, the same as with all other fires, must be conducted. In the case of passenger compartments, to accurately examine fire patterns and eliminate ignition sources requires extensive delayering of the fire debris. Along the way, many potential ignition sources may be encountered and knowledge of vehicle systems becomes important to the investigator in order to effectively eliminate, or confirm, a potential cause.

It is recognized that when the passenger compartment fire progresses to a point of erasing all fire flow and intensity patterns, the determination of cause may not be possible. In many cases, the scene must be delayered and processed to identify the origin and cause. As the scene is systematically documented and delayered, electrical conductors and components will most likely be encountered. There may be beading on the conductors, indicating that they were energized at the time of the fire. Or, they may not have beading. The lack of beading does not confirm that the conductor was not ener-

gized. Beading on conductors may indicate the cause of the fire or be the result of energized conductors reacting as the fire consumes the insulation, causing failures. In order to eliminate electrical conductors, whether beading is present or not, it is beneficial to determine what the conductor energized and where it came from.

While delayering, it is normal to encounter large masses of melted plastics and composite materials. Within these masses are the remains of the vehicle interior, including potential causes, evidence and non-causes that must be eliminated. It is time consuming and tedious to get through a mass of melted material in a search for indications of cause. I've never tested this tip, but apparently some hospitals or veterinary clinics are willing to x-ray a mass of charred and melted material for an investigator. A better option may be the local bomb squads who normally have portable x-ray equipment. To examine electrical components or conductors, the private investigator has the potential resource of the engineer or automotive expert, but for the municipal investigator, these resources may not be available.

The municipal investigator may benefit from the involvement of a private investigator by obtaining information from an engineering or mechanical examination. This is a time when the flow of information goes from private to municipal investigator; so don't fail to take advantage of the opportunity. Also, mechanics may be consulted, usually at no cost, to identify the electrical components in question. The mechanics may also provide manuals that identify electrical circuits. These processes can be time consuming, so a fire is best left under investigation pending this potential information. Allowing an investigation to continue for a week or two before making a call is much easier than reversing an opin-

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ion that was put to paper to meet a time line.

Think about the following scenario which most of us have encountered; a vehicle fire is extinguished in a remote part of the jurisdiction, in an area known for stolen vehicles to be stripped and dumped. The fire originated in the passenger compartment and the vehicle has been reported stolen. The fire damage is extensive enough that the investigator can't determine if the fire started in the passenger or engine compartment. Relatively all combustible material has been consumed from the seats and dashboard, but the investigator can tell that the stereo and front seats were removed.

Can the accidental ignition sources in this scenario be eliminated and is the location of the vehicle and the situation surrounding the event significant enough to allow a determination of cause? Anyone reading this may be thinking that this is obviously an incendiary fire, but can the determination be made using the Scientific Method? Is it possible that while preparing to strip the vehicle there was an accidental event, such as a fuel leak ignited by an ignition spark, ignition of brush under the vehicle, or an electrical failure?

Consider another scenario, which is a true story. An older model small car was burning one evening on a residential street, next to a freeway on-ramp, in a high-crime part of town. The vehicle was parked at an angle to the curb, as if it was abandoned in a hurry. Witnesses report that four young men pulled to the curb and ran from the car laughing, leaving the doors open, and a few moments later the interior of the car was burning.

The passenger compartment sustained heavy fire damage and it was determined that the fire started in the front half of the passenger compartment. It had all the appearances of a stolen vehicle, taken for a joy ride, which was dumped and burned.

Later, the owner of the vehicle stated that he let four young men from the neighborhood take the car for a test drive and hadn't heard from them since. He didn't call the police because he figured they would bring it back eventually. He provided the location of the young men.

The four young men were interviewed individually and their accounts were consistent and considered credible, per the experienced police detective who conducted the interviews. They were taking the car for a test-drive when smoke started coming from under the dashboard. As they were preparing to

pull to the curb, small flames began to extend up the front of the dashboard. They ran away from the car, finding the event very funny, because they were preparing to give the owner of the vehicle \$300 for the car after the test drive. During the interview they were very candid and pleased with their good luck. They didn't think that it was bad manners not to notify the owner of the vehicle, since he had let them test-drive a car that was obviously dangerous.

In fire investigations, we are faced with forming opinions on events that are most times not witnessed. This is why we rely on proven facts regarding fire behavior and the analysis of fire patterns to determine a sequence of events. Sometimes, it seems that degrees of certainty should be "what we suspect, what we know, and what we can prove" instead of "undetermined, possible, probable, and conclusive." Passenger compartment vehicle fires often fall into the "what we suspect" or "what we know" category.

If the vehicle was stolen, left in a remote location, and burned, it probably is incendiary. This proves to be true almost always. The same can be said for a passenger compartment fire to a vehicle parked in an apartment carport, off an alley, that burns at 3:00 a.m. The vehicle was not stolen and is where the

owner last parked it. Something had to bring the heat, fuel and oxygen together, but is it incendiary or accidental? Regardless, there is a point where the fire takes away our ability to correctly call a fire incendiary, even though we believe that it is. In the cases where a determination of cause is not possible, but the fire is believed to be incendiary, realigning the investigation to identify potential insurance fraud or other motives may still pay off.

NFPA 921, 2001 Edition, Section 22.8.1, addresses the elimination of individual systems in the compartment of origin and refers the reader to Section 22.5 through 22.5.8, which describes the ignition potentials throughout a vehicle. Sections 22.9 Total Burns and 22.10 Stolen Vehicles are also excellent review material for a vehicle fire investigation.

As you are coming to a determination of cause, decide if you will be able to verbalize the elimination of all other ignition sources to the satisfaction of a jury. The bottom line is, when you are on the stand, you stand alone. Be sure that your opinion is supported by the fire indicators and that the elimination of potential ignition sources is on a solid foundation of facts and documented observations. As in other types of fire investigations, training, education and experience, as well as the accessory skills, such as knowledge of building construction, electricity, or vehicles, will make some fire investigators more comfortable eliminating potential ignition sources than others. Know your strengths and limitations and continue to gather information

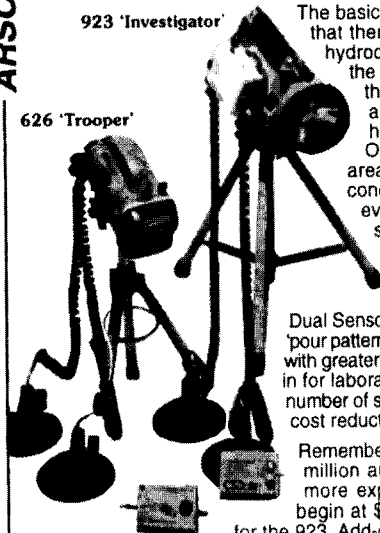
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