D9 The Explosive Destruction of a Horse Trailer With Integrated Living Quarters

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Learning Overview: The goal of this presentation is to share with the forensic science community the detailed methodology used to determine the root cause of an explosion and flash fire within a recreational vehicle that severely burned two victims.

Impact on the Forensic Science Community: This presentation will impact the forensic science community by providing a detailed discussion regarding the unusual failure mode of a sewer system commonly used in recreational vehicles. An example of the risks and costs associated with expectation bias will also be discussed.

The incident to be presented and discussed involved a horse trailer with integrated living quarters that was involved in a gas explosion, which resulted in two severely burned occupants. The trailer with living quarters was being used to attend an equine event by two female enthusiasts. At the time of the explosion, the two occupants were within the living quarters of the horse trailer when a fugitive gas ignited, causing the severe explosion and flash fire. The two occupants were able to self-extricate themselves from the burning trailer. Upon exiting the trailer, one of the occupants was on fire. Witnesses quickly placed her on the ground and extinguished the flames. Both of the occupants suffered serious burn injuries.

The trailer and living quarters were severely damaged by the explosion and flash fire, resulting in significant investigative challenges. A team of experts with specialized skills in fire/explosion origin and cause, gas migration and gas explosion energy, mechanical and materials engineering, Recreational Vehicle (RV) codes and standards, and gas detection technology were quickly retained. The initial investigation revealed that the trailer was equipped with Liquefied Petroleum Gas (LPG) -fired appliances, which included a gas refrigerator, gas furnace, gas stove top, and a gas water heater. The entire LPG system, including all piping, fittings, controls, and appliances, were inspected and tested for leaks multiple times. After failing to find the source of the fugitive gas in the LPG components, the investigative team chose to consider the possibility that sewer gas from the onboard sewer system could have been the source of gas that exploded. After obtaining additional discovery and completing additional investigation, interviews (including the finding that there had never been a case involving a sewer gas explosion in a RV), and testing, the investigation ultimately revealed that the explosion and resulting conflagration were the result of errant sewer gas (i.e., methane). This finding was consistent with the discovery documents, which revealed that the black water holding tank had been replaced after having been torn from the trailer during an accident. The cause of the sewer gas leak was determined to be the failure to properly install the black water holding system, which allowed sewer gas to migrate into the living quarters of the trailer where the sewer gas mixed with air, ignited, and exploded. If the black water holding system had been properly installed, there would not have been an explosion and flash fire and the two female occupants would not have been seriously burned.

Gas Fire/Exposion, Recreational Vehicle Fire/Explosion, Sewer Gas

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