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by S R

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Improvised Explosive Devices (IEDs)

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Question 1

Over the past years, arson cases relative to the myriad of the criminal justice world have tremendously evolved. In most instances, arson cases commonly had no DNA related to them; besides, they depended on "professional" testimony anything but professional. At the onset of arson searches, there existed no definite prerequisites making a given person a professional on what could trigger an inferno or an appraisal, whether it was arson or not. A good deal of folks was unjustly convicted (Lentini, 2012). As a result, they died due to faulty professionals who purported to be professionals on investigations concerning arson cases. For an individual to assume the role of a fire investigator, it necessitates that the person is well versed in both Chemistry and Physics. It took long for a competent standard assessment for an individual to ascertain if they were an arson investigating professional. The current prevailing standard took Richey v Bradshaw's collective efforts**,** 498 F.3d 344 (Redle & Plourd, 2020). Nonetheless, NFPA 1033 and NFPA 921 outline the fundamental requirement. The former deals with Standard for Professional Qualifications for Fire Investigator, whereas the latter concerns Guide to Fire and Explosion Investigations.

Numerous past reports of professional testimony preceding setting up this standard depended on possible positives of K9 alarms. Likewise, they rely on the proof that the fire ended up seeming to have a quickening agent. In 1996, the International Association of Arson Investigators (IAAI) questioned the scientific standard that was set up (NIJ, 2009). According to IAAI, fire investigations were not that scientific hence it did not necessitate to hold investigators to a strict reliability standard.

Ultimately, there existed enough cases having faulty claims by the so-called professionals. This led to the United States Supreme court to convincing folks it was imperative

and obligatory to acknowledge the advised scientific approach. The latter persuasion happened in 1999 during the Kumho Tire v Carmichael case (Young, 2017). In a Guide for Public Safety Personnel, NFPA 921 got noted as a benchmark in United States Department of Justice research report. This report which formed the guide mentioned above, got published under the appellation Fire and Arson Scene Evidence. Although IAAI had dispelled this research report for many years, it for the first time endorsed it after the Department of Justice (DOJ) had completed its release.

Consequently, after the inaugural acceptance of the NFPA 921, the period elapsing between 1999 up until 2008 saw a nine percent decrease in cases of arson transversely across the country, as reported by the NFPA. It got established that many of the arson cases previously said had their causal agent as the absence of a scientific standard that could hold all fire investigators responsible for their determinations. Subsequently, about a twenty percent decrease in arson cases was experienced by the same study carried in Massachusetts and Texas states for twenty years.

NFPA 921 was a ground-breaking milestone in the evolution of fire investigation. Thus, besides it, the United States community of fire investigators saw novel science to aid in post-flashover burn investigations. The term flashover refers to change that occurs in a structure fire when an inferno racing down a given structure already has used all the fuel comprisable. The fire eventually can only grow where enough ventilation prevails for it (Lentini, 2012). At this juncture, fire may have shifted from being controlled by fuel to ventilation-controlled status—for instance, a 2005 ATF study used fifty-three participating investigators and two distinctively separate rooms. ATF set ablaze the two rooms and ultimately requested the participating investigators to walk through the crime scene to identify the precise spot where the fire

originated. After critical analysis and evaluation of the crime scene, only three out of the participating investigators managed to precisely identify by pinpointing the fire's cause besides its point of origin. On the other hand, the proportion of failure which hit a ninety percent rate triggered many different questions. Nevertheless, it was not as precise as perceived upfront to prove older ideology of lowest burn as well as deepest char.

The source's false identification may result in false concussions regarding how fire started, contributing to high arson stats. Back in 1982 K9s use was in arson cases. In all these years, there have been questions on using K9s on their use as well as validity to be taken as evidence in a given case. As a result, the notion was if an individual carries a briefcase simultaneously and a dog raises an alarm on their briefcase for drugs and there are none, then no charges against them (NIJ, 2009). A similar argument could be raised when a K9 alert on a given area accelerates. The utilization method of K9 has been obsolete with progress in laboratory efficiency.

Computer fire models are accompanied by various variables as far as reliability in court is concerned. There will always be a human error; concerning computer models, they rely on examiner's ability in making valid assumptions or rather approximations (Gorbett, CFEI & IAAI-CFI, 2008). If there exists a wrong assumption, the result of every model will lead to a bad outcome. Even taking measurements concerning fire tests, models still portray uncertainties to a maximum of 30%. Because models does not show where fires start; hence investigators misusing them. The only manner to get best result from a fire computer model is having a videotape proving flashover together with time taken getting there as well as put off the fire. For that reason, such models are absolutely premature as enough evidence in criminal cases as preventing fires in a given structure.

Question 2

An improvised explosive device, commonly known as IED, is the perfect tool for asymmetric warfare used in urban and militant groups. The IED or homemade bomb is common among insurgents because it is cheap and easy to make. IEDs with unfortunate consistency in Afghanistan, Iraq, and Syria comprise conventional explosives and detonating mechanisms. The weapon is standard among insurgents, commando units, and guerillas during conflicts and was the most common weapon of choice in the Iraq war, accounting for close to 40% of coalition deaths (Da Silva et al., 2020). Other entities like the Hezbollah and Chechen Insurgents have extensively used IEDs when fighting conventional militaries. IEDs also took place in the World Trade Center bombing in 1993.

IED consists of lethal and destructive chemicals that destroy and disrupt personnel and vehicles. They are strategically used to delay or distract opposing forces. In addition to that, they comprise military hardware or homemade explosives. An IED consists of an explosive charge, an electric system to initiate the electrical charge to detonate the device, and a detonator. In addition to that, it helps in fighting against armored targets. Also, there is great diversity in the design of IEDs. For instance, they are triggered via remote control, magnetic or infra-red triggers. In some cases, several IEDs come together to destroy a larger target.

Terror groups use electronic components like mobile phones, munitions, garage door openers, and washing machine timers when making IEDs. In addition to that, some novices use experimental materials resulting in premature explosions that kill or maim them in the process. Also, many IEDs use conventional material for their explosive load. However, the threat of chemical, biological, and radioactive materials exists, with the prospect of creating far-reaching casualties and life-threatening effects. In some instances, terror groups use trucks and cars to

transport massive payloads of explosives against civilian and military targets. Such IEDs are called vehicle-borne improvised explosive devices.

Nonetheless, one of the most common IEDs is the radio-controlled IED. Before the 1970s, the use of IED was uncommon. Technological advances like radio have been well-deployed in IEDs' detonation like was witnessed since the commencement of the Iraq war, where technically complex systems were adopted (Ursano et al., 2017). Mobile phones, handheld devices, pagers, and home mad electronic equipment are components of radio-controlled IEDs.

Another notable IED is the pipe bomb, made of a tightly sealed pipe filled with exploding components. The containment of explosive material inside the pipe ensures that even a small explosion can result in a relatively large explosion. The exploding shrapnel from the fragmenting pipe creates another lethal weapon that causes bodily harm and even death. In addition to that, making or having a pipe bomb is a criminal offense in many countries, which is punishable by law. In terms of design, a pipe bomb component consists of a steel water tube section, with the exploding mixture placed inside the tube enclosed on both ends using brass caps or steel. A fuse is inserted inside the pipe, with a lead running from a hole on side or one o caped ends. The fuse is electric, with a wire connected to a timer and a battery, or a standard fuse. All of the components used to make a pipe bomb are easily obtainable, making it common among terror groups.

The fragmentation of pipe bombs depends on the amount of pressure built inside the tube and the tube's thickness. In their operation mode, pipe bombs generally concentrate force in them and release it promptly via the outer casing's failure. Plastic tubes can make this type of IED, but metals have a higher burst strength. Hence they are preferred by insurgent groups. In addition to that, the increased power of the metal ensures that the pipe bomb produces a massive concussive

force. For instance, a one-inch steel pipe with a specific strength of 1010 psi can create a pressure of 8090 psi when it explodes.

Moreover, the pipe casing can also fragment in different ways, depending on the thickness and the casing material's flexibility. Also, the strength of the blast from a pipe bomb is proportional to the thickness of the metal tube used. For example, if one uses a thick metal tube, the impact and the explosion from the bomb are more significant and more destructive than a metal tube with a reduced thickness is used to make the IED. Regarding how the bomb fragments, if the pressure inside the metal pipe is low, the metal pipe deforms until it becomes thin, a hole is formed in the tube, leading to a release in pressure in the form of gas, but there is no shrapnel. However, when the metal pipe gets sealed correctly and there is significant pressure inside the IED, the increasing pressure causes the metal to crystalize. Shattering in fragments pushed outwards in all directions, with high kinetic energy, causing significant damage and injury (Da Silva et al., 2020). In addition to that, Pipe bombs can detonate remotely using a radio or a mobile device.

Whereas America and other developed countries continue to invest in technology that blocks or jams, burns and destroys IEDs that can detonate remotely, terror organizations are also coming up with different ways of ensuring their IEDs explode and inflict harm as intended. In this regard, the war on IEDs and terror must take a multidisciplinary approach. Countries must collaborate to deal with the IED menace that has killed, injured, and maimed many people globally.

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