B63 Explosive Residue Transfer From Various Explosive Ordinance Disposal (EOD) Render Safe Procedures (RSPs)

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Learning Overview: After attending this presentation, attendees will understand various RSPs used by bomb technicians in the EOD field and how these procedures can potentially transfer explosive residue onto Improvised Explosive Devices (IEDs). Attendees will also learn what specific compounds are found in these residues.

Impact on the Forensic Science Community: This presentation will impact the forensic science community by providing information about residues left by some RSPs and how this can affect forensic analysis of IEDs. Examiners will now be aware that residues found on IEDs may have originated from the RSPs and not from the main charge of the device if it was initiated and consumed. This will help them with the interpretation of their results that can ultimately affect the outcome of a case.

Before an IED is sent to a laboratory for analysis, it needs to be rendered safe if it did not already explode or initiate, which can lead to potential contamination of the evidence if residue analysis is important. RSPs include utilizing a Percussion-Actuated Non-electric (PAN) disrupter or a fluid-filled bottle disrupter. PAN disrupters utilize shotgun rounds to propel liquid or solid projectiles that disrupt the electrical fuzing system or break open the container. The fluid-filled bottle disrupter utilizes a plastic bottle that is filled with water and a detonation cord used to disrupt soft containers, such as backpacks.

While the goal of these disrupters is to render the device safe without having it initiate, occasionally the procedure will fail and the IED will detonate. If this occurs, only the residue on the IED fragments can be chemically analyzed to ascertain the identity of the explosive. However, since these RSPs also use explosives, they too can impart residue on the IED. Smokeless powder is used in the PAN disrupter ammunition, which can also be found as a main charge in IEDs. Compounds of analytical interest in smokeless powders include Nitroglycerin (NG), Diphenylamine (DPA), Ethyl Centralite (EC), and Methyl Centralite (MC). The bottle disrupter utilizes a Pentaerythritol Tetranitrate (PETN) -filled detonation cord, another explosive that may be used in IEDs.

Before any testing was conducted, analysis of the bulk powder used in the shotgun ammunition and detonation cord was conducted to determine the explosives and stabilizers present in each. The powders were then burned onto the various substrates to determine if the compounds would decompose after deflagration. To test whether RSPs impart residue on IEDs, the disrupters were fired onto inert containers used in IED construction, such as pipes and backpacks. These were later analyzed for post-blast residue. The PAN disrupter was loaded with two different rounds. A blank was used to shoot a water column at a Polyvinylchloride (PVC) pipe, while a birdshot cartridge was used to target a steel pipe. The water from the bottle disrupter was imparted onto a backpack. All the tests were performed in triplicate.

Instrumentation used in the analysis of the residues included a Gas Chromatograph/Mass Spectrometer (GC/MS), a Liquid Chromatograph/Mass Spectrometer (LC/MS), and a Gas Chromatograph with an Electron Capture Detector (GC/ECD). Analysis of the smokeless powder from both of the shotgun ammunitions used in the PAN disrupter showed the presence of NG, DPA, and EC. Only PETN was identified in the detonation cord used in the bottle disrupter. The residue from the smokeless powder and PETN showed no decomposition of the analytes after they were burned. Two of the three steel pipes rendered safe with the birdshot had detectable amounts of NG and EC. No DPA was detected on any of the steel pipes. None of the PVC pipes had detectable amounts of NG, EC, or DPA. Trace amounts of PETN were detected on two out of the three backpacks. Overall, finding such residue in casework should not rule out the possibility that an individual used a particular explosive in the construction of the IED, but examiners should be aware of residues left by disrupters, especially if the device initiates during the RSP.

Explosives Residue, Render Safe Procedure, Improvised Explosive Device

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