



## Engineering Sciences Section – 2010

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### **C18 Use of Supplementary Analytical Techniques in Firearm Tool Mark Analyses: Utilizing Mechanical Engineering Knowledge and Experience, Deductive Reasoning, and Supplemental Analytical Techniques to Minimize the Number of “Inconclusive” Conclusions**

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After attending this presentation, attendees will gain knowledge in techniques that may be utilized to minimize the number of “inconclusive” conclusions drawn following analysis of tool marks

found on ammunition cartridge cases recovered from shooting crime scenes.

This presentation will impact the forensic science community in the way that cartridge case tool mark analyses are conducted, and will minimize the number of “inconclusive” conclusions published by crime labs.

Fired cartridge cases are frequently recovered from shooting crime scenes. These cartridge cases contain tool marks created by the firearm in which they were discharged. The most common tool marks used for identification purposes are the firing pin impression and the breech face markings. Crime laboratory employees use a comparison microscope to compare marks on the cases recovered at the crime scene to marks left on cases that they personally have test fired in a suspect firearm or firearms.

In many laboratories, the employees must follow prescribed laboratory protocols and/or trade association recommendations with regard to what analyses may be performed and what conclusions are allowed be drawn. The prescribed protocols stipulate that the examiner must first determine that the suspect firearm and the recovered cartridge cases are of the same, or compatible, caliber. Once this is affirmed the examiner may move on to the microscopic comparison analysis. If distinctively individual and unique characteristics are present, then the examiner may declare either an identification, or an exclusion. If insufficient distinctive individual or unique firing pin, breech face, or other markings can be found, then the laboratory protocol typically stipulates that the examiner must declare that the examination is “inconclusive.” The “inconclusive” conclusion is relatively common, and it diminishes the overall probative value of the tool mark analysis process. Many defence attorneys believe that juries view the “inconclusive” statement as a weak “identification,” and that the implication of this for defendants is negative in nature. Clearly, less “inconclusive” conclusions would benefit the justice system.

The paper will describe and discuss how mechanical engineering knowledge and experience regarding manufacturing techniques and mechanical function, plus the application of logical supplemental analyses and deductive reasoning, can be used to reduce the number of “inconclusive” conclusions. The techniques will be illustrated by case studies.

**Mechanical Engineering, Tool Mark, Inconclusive**