C16 Tool Mark Creation and Transfer Issues in Firearms

John R. Nixon, MBA, Athena Research & Consulting, PO Box 66, Bippus, IN 46713*

After attending this presentation, attendees will gain knowledge in the mechanisms and mechanical processes behind tool mark creation on firearms components during manufacture. Tool mark analysis practitioners will gain knowledge of component manufacture processes, the mechanical production and transfer of tool marks, and an appreciation of the impact of modern manufacturing processes on tool mark formation and individuality. It is anticipated that this presentation will be of particular interest and benefit to attorneys and investigators.

The presentation will impact the forensic science community in the way that firearm tool mark analyses are viewed in terms of tool mark creation, and their potential for individuality & variability within the context of the manufacturing techniques employed in firearms component production.

The paper will discuss the production of tool marks in firearm components that are manufactured through the use of machine tools, hand tools, and other techniques. The impact of recent manufacturing technological innovations with regard to tool mark creation, and the implications for the discipline of tool mark analysis and comparison, will be discussed.

Firearms consist of numerous components, and several of the components will leave tool marks on ammunition components discharged through the firearm. The most common firearm components that create tool marks on ammunition components are the barrel, breech face, firing pin, extractor, and ejector. There are numerous process alternatives when it comes to the manufacturing of these components, particularly in the rifling of barrels. The tool marks imparted to the ammunition components comprise stria and impressions – stria being generated by tool marks on the firearm components, and impressions being formed by the tool marks on the firearm components.

Linking particular individual firearms to fired ammunition components recovered from crime scenes is a routine activity for most crime labs. Tool mark identifications are performed using tool mark analysis and comparison, with the aid of a comparison microscope. These analyses are performed by individuals with job titles such as “forensic scientist” or “firearms & tool mark examiner”. It is almost unheard of for a one of these practitioners to have mechanical engineering qualifications, or any experience in the use of machine tools
& hand tools in a commercial manufacturing environment.

In recent years use of the tool mark identification process, and the qualifications of its practitioners, have came under intense scrutiny from the legal community, and some forensic scientists. The process has been disputed via *Daubert* and *Frye* challenges in state and federal courts across the United States. The discipline was a subject of discussion in the February 2009 National Academy of Sciences Report *Strengthening Forensic Science in the United States: A Path Forward*. Some attorneys have noted that tool mark analysis practitioners provide differing court testimony with regard to how tool marks on firearms components are created. The paper will discuss these issues with the aid of case studies.

Mechanical Engineering, Tool Mark, Firearm

 ** Presenting Author*