B127 An Examination of Striations on Bullets Discharged From 3D-Printed Metallic Gun Barrels

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After attending this presentation, attendees will better understand the 3D printing process to design and manufacture firearms. Direct Metal Laser Sintering (DMLS) will be used as an example to discuss the new manufacturing process and its potential influences in firearms examination.

This presentation will impact the forensic science community by providing new data in firearms examination of 3D-printed metallic gun barrels and tool marks left on bullets associated with them. Two identical metallic gun barrels 3D printed from the same digital file were used to test the impact of 3D manufacturing in firearms examinations.

3D printing is a manufacturing process that potentially can transform a virtual digital model into a real-world 3D solid object. This process has been a popular technique to produce a phototype of any design. Because this manufacturing process is becoming affordable and available, 3D printing is becoming a method of choice to manufacture functional product in many industry, including firearms.

In this work, two identical metallic gun barrels were 3D-printed from the same digital file from the same printing chamber. The model was built based on the physical dimensions of a 1911 pistol using a computer software without the use of 3D scanners. Because the roughness of the 3D-printed gun barrel surface, some exterior surface of the barrels required some hand-fitting in order to fit into a 1911 pistol. The surface of the interior part of the gun barrel was left untreated in this study. After fitting the barrels, 100 cartridges were discharged from each of these two identical barrels to examine and compare striations left on the bullets.

The first 50 rounds, from both barrels, discharged without incident. The only issue noted was that a substantial number of test fires did not properly extract and resulted in a stove-piped cartridge case. At approximately the 65th test fire, from each barrel, the slide started to lock up and would not cycle back to allow the cartridge cases to extract. Due to the locked slide, it became necessary to tap the slide back with a ball-peen hammer to remove the fired cartridge case. Multiple attempts were made to clean, dremel, and oil the chambers in hopes of improving extraction, none of which proved successful, and the locking up continued through the end of the 100 test fire cycles. Post-printing surface treatment of the barrel may be needed to eliminate this issue. Examination of the 100 fired bullets from either barrel revealed that all 100 bullets could easily be identified to each other. The striations maintained their consistency in individual characteristics over the course of the test firing. When comparing the test fires from two identical 3D printed barrels, the bullets were easily eliminated as having been fired from the same barrel.

Firearms Examination, 3D Printing, Direct Metal Laser Sintering

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