Evaluation of Firearms Traces on the Cartridge Cases Extracted from Newly Manufactured Arex Delta M Gen. 2 Handguns

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During firing, a firearm's surface leaves an imprint on the surface of the projectiles, and by analyzing and comparing individual firearm traces on the projectiles, a trained investigator can establish a connection between the projectiles and the specific firearm that fired them. Individual characteristics of firearm traces are unique, occurring during firearms production and use, making them practically impossible to find on other firearms. However, the phrase 'practically impossible' lacks a mathematical or other basis and therefore requires empirical verification. Additionally, weapon manufacturing processes are continuously evolving, and tools are becoming more durable, potentially decreasing the likelihood of uniqueness. In this research, we investigated whether we could accurately link cartridge cases expelled from the newly produced Arex Delta M Gen.2 handguns. We selected ten handguns from two distinct batches, which were manufactured in close proximity to each other. Some of the slides were even made consecutively, allowing us to examine potential subclass characteristics. We conducted our investigations and comparisons using the Evofinder® automated ballistic identification system. Initially, we visually compared cartridge cases from the same handguns and discovered that they possessed enough individual characteristics to be attributed to the same or possibly the same origin. Subsequently, we compared spent cartridge cases expelled from other handguns within the same batch and confirmed that the firearm marks did not match, or probably did not match. We applied the auto-identification algorithm to each cartridge case and observed the matching positions of cartridges expelled from the same handguns. We found that it is not obvious that the system will classify the cartridge cases fired from the same handgun into first matching positions, and it is even less likely for the system itself to assign them to the same origin.

Keywords: Arex Delta, Evofinder, forensics, traces of a weapon, cartridge casing

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