

Technical Note

Cartridge Casing Ejection Patterns from Two Types of 9 mm Self-loading Pistols Can Be Distinguished from Each Other

*Ian K. Pepper*¹
*Steve T. Bloomer*²

Abstract: Cartridge casings that are recovered from the scene of a shooting can be of probative value in an investigation. One hundred rounds of 9 mm jacketed soft-point ammunition were fired from two self-loading pistols (Glock 17 and Sig Sauer P226). The resulting cartridge case ejection patterns were surveyed and plotted. The results show that the ejection patterns from the two self-loading pistols were different.

Introduction

The final resting place of cartridge casings at the scene of a shooting is important to an investigation [1, 2]. Cartridge casings can reveal a host of information (e.g., the type and caliber of the firearm used) along with unique evidence (e.g., extractor, ejector, chambering, and firing pin marks) that may allow them to be linked to a suspect's firearm [3]. It is also possible to obtain a DNA profile from the handled cartridge casing [4].

In January 2005, research was commenced with the objective of identifying whether there is a significant difference in the "at rest" patterns of cartridge casings ejected from two types of self-loading pistols.

Received November 17, 2005; accepted December 15, 2005

¹ Principal Lecturer, School of Social Sciences and Law, University of Teesside, Middlesbrough, U.K.

² Principal Lecturer, School of Science and Technology, University of Teesside, Middlesbrough, U.K.

Materials and Methods

The research was conducted with the assistance of the Cleveland and Durham Police Tactical Training Centre. Two types of 9 mm self-loading pistols, an Austrian-manufactured Glock 17 weighing 624.82 g and a German-manufactured Sig Sauer P226 weighing 802.29 g, were selected from those available in the police armory. Both firearms were well-maintained police-issued weapons.

The shooter, a police firearms instructor, held the weapon using the Weaver stance, gripping the firearm in his right hand, which was supported by his left hand (Figure 1). The shooter fired fifty Luger 9 mm jacketed soft-point 6.15 g (95 grain) rounds (from 5 ten-round magazines) from the Glock. The firearm was aimed at a full-sized silhouette target in a 25-meter indoor range. (The use of an indoor range greatly reduces the effects that weather may have on the ejection patterns.) In line with previously conducted research, the cartridge casings were ejected onto sand to reduce bounce and roll [1]. All of the fired rounds hit the target and were grouped in a 44 cm x 55 cm area.

The ejection patterns were surveyed using a Sokkia Set 5W/5WS Total Station (coordinate measuring system) and an optical target (Figure 2) to allow the accurate plotting of the 50 cartridge casings. This procedure was then repeated with the Sig Sauer pistol with 50 rounds fired; however, one round jammed and one cartridge case hit the shooter, so both were discounted from the research. An experienced surveyor led the surveying using calibrated measuring equipment, ensuring that the plotting was accurate. The collected data was then downloaded into a software program that produced Figure 3.



Figure 1
The hand grip.



Figure 2
The optical target for the surveying was placed where the cartridge casings landed in the sand.

Results

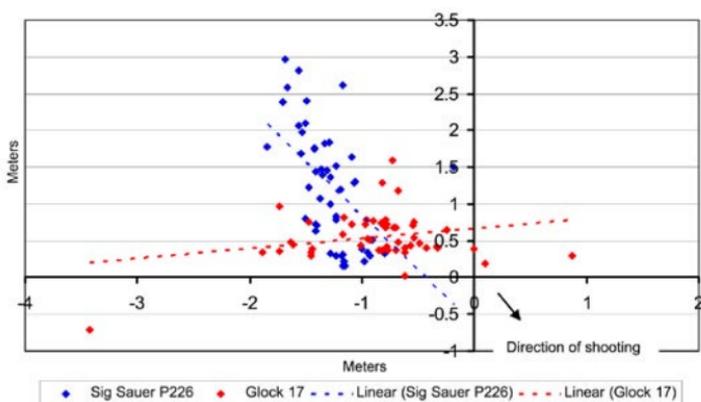


Figure 3

Combined cartridge case ejection patterns from a 9 mm Sig Sauer P226 and a 9 mm Glock with trendlines (ejection port at reference $X = 0$ and $Y = 0$).

Discussion

The results of the research support the proposition that there are two distinct patterns for the cartridge casings ejected from the Glock and the Sig Sauer. Both weapons produced a grouping of cartridge casings to the rear and right of the shooter. However, the Glock produced a more linear spread of cartridge casings than did the Sig Sauer (Figure 3). The main difference between the two patterns is the trendline: The Glock produced an angular trendline from the direction of shooting; the Sig Sauer produced a trendline that was more parallel to the direction of shooting.

With the ejection ports of both self-loading pistols plotted in the same position, the final resting place of the cartridge casings confirms a relationship between the distance on the X axis and the Y axis (Figure 3).

Variables that may affect the final ejection patterns include height and grip of the shooter; internal wear within the firearm; yaw, pitch, and roll of the firearm as it is being fired; differing powers of the ammunition; surface on which the cartridge casing lands; prevailing weather conditions; and external interference in actual casework (e.g., casings being accidentally kicked by offenders, victims, and responders).

Conclusion

Cartridge casings are valuable pieces of forensic evidence that can be recovered from the scene of a crime. Therefore, efforts should be made to locate the scene of the incident and recover the cartridge casings [2]. Although beyond the scope of this research, it is also suggested that if the position of the cartridge casings, the type of firearm, and direction of shooting are known, and then the casings are accurately plotted, an approximation may be made of the location and orientation of the shooter [2].

It was possible to differentiate between the cartridge casing ejection patterns of the two self-loading pistols. However, there are a number of factors that can affect the ejection patterns (e.g., the grip of the shooter, the surface that the cartridge case lands on, etc.) that should be considered in further research and casework. The results of the current research are limited to the firearms used and existing conditions.

For further information, please contact:

Ian K. Pepper
Principal Lecturer, School of Social Sciences and Law
University of Teesside
Middlesbrough
TS1 3BA
United Kingdom
I.Pepper@tees.ac.uk

References

1. Haag, L. C. Cartridge Case Ejection Patterns. *AFTE J.* **1998**, 30 (2), 300-302.
2. Fisher, B. *Techniques of Crime Scene Investigation*, 6 ed.; CRC Press: Boca Raton, FL, 2002; pp 287 - 298.
3. Warlow, T. A. *Firearms, the Law and Forensic Ballistics*; Taylor and Francis: London, 1996.
4. Szibor, R.; Michael, M.; Plate, I.; Krause, D. Efficiency of Forensic mtDNA Analysis: Case Examples Demonstrating the Identification of Traces. *For. Sci. Int.* **2000**, 113 (1-3), 71-78.