Major Grzegorz Bogiel, M.Sc. Eng.
Senior Scientific and Technical Specialist at the Toolmark and Ballistic Departament of the Central Forensic Laboratory of the Police
grzegorz.bogiel@policja.gov.pl
Major Paweł Szymanik, M.Sc. Eng.
Expert at the Toolmark and Ballistic Departamen of the Central Forensic Laboratory of the Police
pawel.szymanik@policja.gov.pl

A follow-up investigation of the defect of Walther P99 pistol

Summary

This article presents an experimental reconstruction of a failure of the Walther P99 pistol, involving the tearing of a fragment of the breech face and ejecting weapon elements in the shooter's eye direction. The tests were carried out with the use of a high-speed camera and the software for analysis of video recording. As a result of this experiment, the velocities and energy values of the elements tested were obtained.

Keywords: Walther P99, failure, slide end cap, breech face, eye injury, high-speed camera, motion analysis

Introduction

A programme for the modernization of the Police, which has been implemented since 2001, provides, among others, for the replacement of small service firearms, i.e. pistols. The consecutive public tenders have been consistently won by the Walther P99 pistol cal. 9 mm x 19 of German construction, partially manufactured and assembled in Poland. It is a modern polymer frame pistol with a high-capacity magazine and a double-action (DA) trigger mechanism. What distinguishes it from other pistols of this type is a release lever disengaging the firing pin. 26 000 pieces of this handgun have been already purchased for the Police in the years 2001-2003. Over several years of exploitation, the P99 turned out to carry the distinguishable defect, not seen in other pistols. Three cases of a peculiar failure have already been recorded. Namely, a fragment of the breech face in the form of a disc with a diameter of approximately 5 mm is torn off during the firing. Pushed to the rear by the pressure of the gunpowder gases escaping through the unsupported primer, the disc exerts an impact on the striker (firing pin mechanism), ejecting it from the breech channel together with the bursting slide end cap made of plastic (with metal pad) designed to close the breech channel. The elements are ejected in the shooter's eye direction.

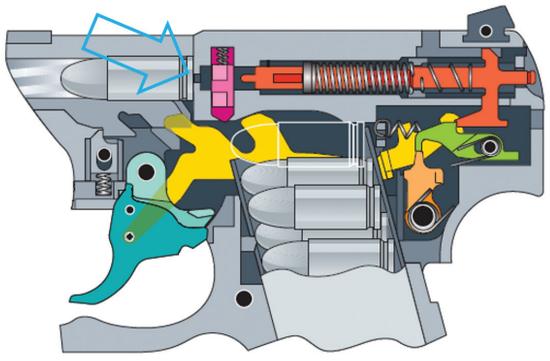

Fig. 1. Cross-section of the P99 pistol. The defective area is marked with an arrow.

Materials and methods

The aim of the experiment was to determine the velocity of the elements ejected in the shooter's eye direction in the case of a failure of the Walther P99 pistol. The pistol used for testing had a breech converted by removing a part of the breech face

with a diameter of 5.2 mm. Such a procedure is the easiest way of simulating the pistol failure. Thus, the experimental pistol differs from the real one by the lack of the breech face fragment that would be torn off during the firing. Under real conditions, this fragment would be ejected to the rear together with the striker (firing pin mechanism) and the slide end cap. The influence of this element could potentially affect the phenomenon investigated (by enhancing or alleviating it), however, the extent of such an influence is difficult to estimate, not least because the blasted breech face fragment, neither as a whole or parts thereof, have never been recovered.

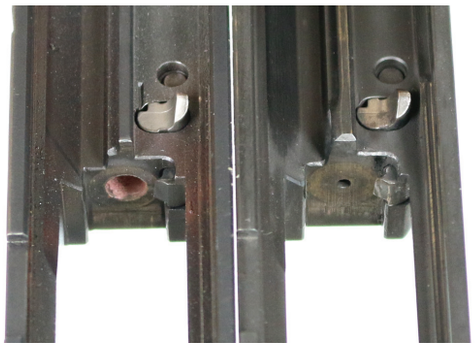

Fig. 2. Test breech face with a 5.2 mm hole (left panel) and in its original (factory) condition (right panel).

The pistol prepared as described was mounted onto the test shooting stand. The chamber was loaded with a Fiocchi pistol cartridge cal. 9 mm x 19 — the type that was used in the most recent case of pistol failure. Next, a shot was fired remotely. The course of the experiment was recorded using a high-speed Phantom v. 711 camera operating at the speed of 10 000 fps.

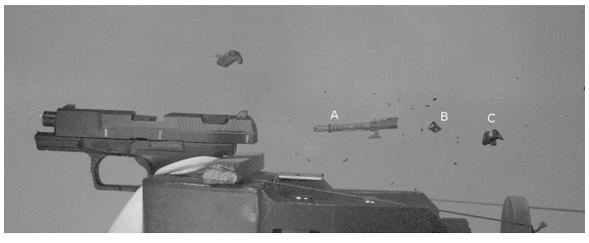

Fig. 3. Still frame from the video recording. See text for explanation.

Results

The video recording of the experimental shooting was analyzed using the Tema Motion software. The velocities of three ejected elements with the largest weights, i.e. firing pin mechanism (marked with the letter A in fig. 3), metal (letter B) and plastic (letter C) fragment of the slide end cap, were plotted on a diagram.

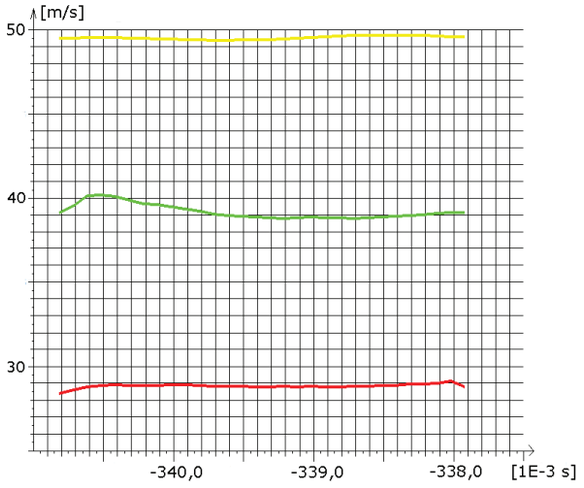

Fig. 4. Velocity diagram. Yellow color – velocity of plastic slide end cap fragment C (49,5 m/s), green – velocity of metal slide end cap fragment B (39 m/s), red – velocity of firing pin mechanism A (29 m/s).

The values of weight, velocity and kinetic energy parameters of the elements tested are summarized in Table 1.

Firing a service weapon requires the shooter to wear the protective goggles. Nowadays, the goggles available on the market meet the requirements of the following EU standards: PN-EN 168:2005, PN-EN 166:2005 and others — mostly MIL-PRF-31013. According to the first two standards, the protective goggles are labeled as:

– S – increased robustness (withstand an impact of a 22 mm nominal diameter steel ball, of 43g minimum mass, striking at the speed of approximately 5.1 m/s., i.e. with an energy of 0.6 J);

– F – low energy impact resistance (withstand an impact of a 6 mm nominal diameter steel ball, of 0.86 g minimum mass, striking at the speed of approximately 45 m/s., i.e. with an energy of 0.9 J).

Table 1. Summary of the weights, velocities and kinetic energies of the elements tested.

Designation	Element	Weight [g]	Velocity [m/s]	Energy [J]
A	firing pin mechanism	11	29	4.6
B	metal element	0.85	39	0.65
C	plastic element	0.61	49.5	0.7

The goggles meeting the requirements of the MIL standard should withstand a 0.15 caliber, 5.8 grain (0.38 g), T37 shaped projectile striking at the speed of 650 feet per second (approximately 198.12 m/s), i.e. with an energy of 7.5 J.

In the case of an intervention undertaken by the police officer, involving the use of firearms, it is presumed that no protective eye wear will be used.

In the medical literature, the reports can be found describing damage caused to the human eye by objects with an energy of approximately 0.63 J and above. The tests were carried out using pig eyes preparations placed in containers filled with 10% gelatin. The eyes were fired at using the projectiles weighing 2.6 grain (0.17 g), 3.5 grain (0.23 g) and 45.5 grain (2.95 g), at the velocities between 4 and 38.1 m/s.

Conclusions

The experiment carried out has confirmed that the failure of the Walther P99 pistol can cause its elements to be ejected in the shooter's eye direction with an energy sufficient to cause an eye injury, even when protective goggles are worn.

The CLKP does not have the equipment, nor methods allowing to determine whether the failures of the Walther P99 pistol involving the tearing of fragmentary elements from the breech face are caused by design or material errors, or perhaps due to faulty processing (e.g. thermal) of the breech, or operational mistakes. It appears appropriate for the manufacturer to determine the exact cause and eliminate it.

One of the intended corrective actions aimed to protect the users of the Walther P99 pistols which are already in service, is the replacement of plastic slide and caps closing the firing pin channel with the metal ones. Such a solution can potentially safeguard eyes of the policemen operating this weapon, however, it will not prevent the failures of the Walther P99 from happening.

Sources of figures and tables:

Figure 1: http://www.carl-walther.de/public/downloads/manuals/P99_Poster_A2_www.pdf.
Figures 2-4: author
Table 1: author

Bibliography

1. *Instrukcja obsługi i użytkowania pistoletu samopowtarzalnego P99*, F.B. „Łucznik", Radom Sp. z o.o.
2. MIL-PRF-31013.
3. PN-EN 168:2005 Personal eye-protection. Non-optical test methods.
4. PN-EN 166:2005 Personal eye-protection. Requirements.
5. Scott, W.R., Lloyd, W.C., Benedict, J.V., Meredith, R. (2000). Ocular Injuries Due to Projectile Impacts. *Annual Proceedings/Association for the Advancement of Automotive Medicine*, *44*.
6. Stanicki, R., Urbańska, D. (2014). Modernizacja wyposażenia Policji. *Kwartalnik Policyjny* [Police Quarterly] *CSP Legionowo*, *5*.

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