The Miami Barrel Saga Continues

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ABSTRACT

The Electronic Spark Reduction Method which resulted in "The Miami Barrel" was not found to significantly enhance the identifiability of fired bullets. Glock was contacted by the City of Miami Police Department and was asked to further research and develop a new barrel. The Miami-Dade Crime Laboratory Bureau was asked to evaluate and report on the reproducibility of marks left by the new barrels. Glock developed a tool to create additional marks in the barrels. This tool created gross marks (subclass characteristics), allowing quick indexing and improved identifications of test fired bullets

Sufficient individual characteristics were found for positive identifications during the initial testing. Durability testing revealed that the individual characteristics and gross marks (subclass characteristics) failed to reproduce as they originally did. It was concluded that the changes made to the Glock barrels by the new tool did not render them readily identifiable..

Introduction:

Various officer-involved shooting incidents reached a climax on April 30, 2001, when an 18 year-old subject was shot by an officer from the City of Miami Police Department (MPD) after fleeing in a stolen Jeep. Three officers who pursued and fired were carrying .40S&W Glock pistols. (1)

The Miami-Dade Police Department (MDPD) Crime Laboratory received the evidence in this case, and after examination, was not able to positively identify which officer's Glock pistol had fired the fatal shot. These findings stirred the community and attracted mass media attention reminiscent of that in the early to mid 1990's, which resulted in an in-depth study of Glock's polygonal-rifled barrels. (2) The Miami-Dade County State Attorney's Office had the evidence forwarded to the Bureau of Alcohol, Tobacco and Firearms (BATF) who concurred with the original findings. This prompted new research and development for a new, readily identifiable Glock barrel.

History:

Prior to 1994, The City of Miami Police Department had a series of high profile police-involved shootings. This resulted in a wide range of community attention due to the fact that the projectiles were not identifiable to the Glock pistols of the shooting officers. At this time, the issued duty weapon of MPD officers was the 9mm Glock pistol, with the department's intent to transition to a .40S&W Glock pistol.

On June 15, 1994, the late John Matthews, formerly of the Royal Canadian Mounted Police (RCMP) laboratory, and a Glock representative met with lab personnel and MPD due to the concerns raised regarding Glock pistols and the inability to consistently identify spent projectiles. While at the MDPD laboratory, Matthews used a scribe to create crude toolmarks inside the barrel, which resulted in a personal signature for each (photo 1). This meeting led Glock Inc. to modify their traditional gun barrel using the Electronic Spark Reduction Method (ESRM) which resulted in "The Miami Barrel"(3) (photo 2). After testing this modified Glock barrel, the ESRM was not found to significantly enhance the identifiability of the bullets (photo 3).

In November 1995, the New York City Police Department (NYCPD) conducted their own series of tests using 9mm Glock 19 pistols with standard polygonal barrels and others with specially designed "conventionally rifled" barrels. (4) The latter barrels were constructed using the same hammer-forging method Glock utilizes; however, the mandrel had lands and grooves cut into them prior to manufacture. The testing using the standard polygonal barrels found 97 of 200 projectiles produced sufficient individual characteristics for a positive identification. On about 90% of these identifications, only approximately 17% of the useful surface of pristine bullets contained useful individual characteristics. The "conventionally rifled" Glock barrels produced sufficient individual characteristics in 183 of 200 projectiles examined. Approximately 53% of the useful surface of these pristine bullets contained the individual characteristics for

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an identification. The NYCPD's results specified that damage to bullets with polygonal rifling (i.e. terminal ballistics) would make an identification very difficult. As for the bullets from "conventionally rifled" Glock barrels, damage would reduce the ability for an identification to a degree that the benefits over the polygonal were only slight. These benefits, if any, would be considerably less than those found in typical conventionally rifled barrels such as those in Smith & Wesson firearms.

On September 27, 2001, the Miami-Dade Police Department was requested to evaluate two modified .40 caliber Glock barrels. Examination of the two barrels revealed that a toolmark had been made in eight different areas at the muzzle of each barrel. It looked as though some type of tool, possibly a chisel of some type, was used to crudely place these tool marks. Initially ten cartridges were fired through each barrel. Two brands of ammunition were used for the testing:

.40 S&W Winchester Ranger, 180 grain SXT
.40 S&W Speer Gold Dot, 180 grain GDHP

Microscopic examination revealed that projectiles fired through the barrel with serial number L18468 were marked by only one of the eight toolmarks in a manner deemed identifiable (photo 4). With regards to projectiles fired through the second barrel with serial number L18469, two of the eight toolmarks left identifiable markings.

Additionally, three hundred (300) rounds were fired through the barrel, serial number L18469. Projectiles 100, 200 and 300 were examined for durability. These projectiles were determined to be identifiable.

Current Testing:

On January 29, 2002, the Miami-Dade Police Department received ten Glock barrels to test and evaluate. A total of twenty-seven bullets (.40 S&W 180 grain Speer Gold Dot) were fired through each barrel. The first 25 fired were to create wear in the barrel and the last two were retained for comparison purposes. Examination of the projectiles and barrels revealed what appeared to be fine lines randomly spaced around the circumference. Five of the ten barrels produced projectiles that were identifiable; however, they were "not readily identifiable" (photo 5). The terms "readily identifiable" and "not readily identifiable" are described by Carr and Fadul (5) as follows:

"The result of 'readily identifiable' means that several areas of the bullet can be positively identified to other bullets of the same brand fired from that pistol (barrel). It further describes the signature of a fired bullet that is typically received in this laboratory as evidence and because of the quality of the signature, we expect to identify it with the comparison microscope."

"The result of 'not readily identifiable' means that tests of the same brand fired in the same pistol (barrel) could not be positively identified or that the identification generally could only be made on a small or select area of the bullet. The term further describes the signature of a fired bullet that is typically received in this laboratory as evidence and because of the general lack of detail or repeatable markings that identifications are difficult or sometimes impossible. It should be noted that all of the test bullets examined are not damaged or expanded, and therefore, they have the potential of receiving maximum transfer of barrel signature for that brand and type of ammunition."

Casts were made of five barrels using hydrophilic vinyl polysiloxane (silicon rubber) casting material, brand name Elite H-D, and an extrusion gun. Luke Haag's testing of this material found it suitable for casting the bore of barrels. (6) One barrel was cross-sectioned and examined (photo 6). Under the stereomicroscope, eight fine lines running the length of the barrel were visualized (photo 7). A tool is most likely pulled or pushed through, then the configuration is changed for the next barrel. According to a BATF source, the tool is started at the 12 o'clock position for the first barrel, then changed for each barrel. The tool appears to twist with a similar pitch as the rifling; it flows along with the land and grooves. Glock advised that the tool is pending patent approval and no further information was available.

Examination under the comparison microscope found these lines do reproduce as gross marks on the bullets. These marks displayed similarities from one barrel to the next and were determined to be subclass characteristics of these new Glock barrels. Concern arose regarding the misuse of these gross marks for identification purposes.

On May 10, 2002, six more barrels were tested and 27 rounds fired through each. Fine lines that were seen on the casts of the barrels were not scoring the circumference of the bullets. A large number of gross markings were repeating from barrel to barrel. As a result, the barrels were found to be not readily identifiable.

On May 29th, a meeting was held between Glock, the City of Miami Police Department and the Miami-Dade Crime Laboratory. Glock's Chief Engineer Reinhold Hirschheiter explained that one tool with a single cutter is used to create the additional marks in the barrels. The tool is passed automatically by machinery producing multiple strikes at each groove. Glock was informed that the cuts being made needed to be deeper and thicker, and be able to score the bullets at their circumference consistently. Glock agreed to

change their specifications to meet our requests, and suggested that a future possibility to consider involved bar coding the barrels. Pictures 8 and 9 (courtesy of Mr. Hirschheiter) depict a cross-section view of the cut produced by the Glock tool and the mark left on a bullet.

Six new barrels were received on July 17th after complying with the requests made at the prior meeting. As before, the barrels were cast and tests fired through each. Initial observations found the gross marks on the casts to be very pronounced. These same gross marks were observed under the microscope as multiple deep cuts or grooves within each land impression (photo 10). Again, concern arose relating to the repeatability of these gross marks from one barrel to the next. These gross marks were considered a subclass characteristic that these Glock barrels obtained during manufacture (photo 11). A total of nine examiners independently examined tests fired through each barrel, as well as, comparison of tests from different barrels. All examiners concluded that each barrel was readily identifiable. There were areas of gross markings that were similar from barrel to barrel (photo 12), however, they could be easily differentiated once the bullet was completely examined and individual characteristics taken into account (photo 13). The problem still existed where a damaged projectile or wear to the barrel could leave little individual characteristics and only the gross markings observed. An examiner unfamiliar with these subclass characteristics could easily misinterpret them for individual characteristics.

The City of Miami Police Department was given 2 barrels and fired 3000 rounds in each to test the durability of the cuts made by the Glock tool. During the testing, two bullets were retained for comparison purposes after reaching the following number of rounds: 250, 500, 1000, 1500, 2000, 2500 and 3000. It should be noted that after each session of test firing, the weapons were cleaned prior to firing. Again examiners were asked to independently evaluate tests from each barrel and tests from the two different barrels and determine whether they are readily identifiable.

The results of the microscopic examination revealed that the bullets obtained from the above testing were found to be "not readily identifiable". It should be noted that it was possible to make a positive identification in select areas of the bullets; however, that does not meet our criteria of readily identifiable. Significant deterioration of individual characteristics could be seen as early as the 250th test fire (photos 14 and 15).

It was also noted that the gross characteristics that marked the bullets very well before the above testing failed to reproduce as it originally did. The width, depth and definition of the gross marks diminished as the testing progressed. By the 3000th round, indexing of the test fires becomes very difficult as the gross marks used prior where either hardly visible or non-existent. Pictures 16 through 21 demonstrate the loss of individual and sub-class characteristics from the initial tests compared to the final tests.

The findings of this study have been reported to the City of Miami Police Department. Further testing is anticipated as Glock continues their efforts to improve the Miami Barrel.

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Supra Note 2

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Supra Note 2

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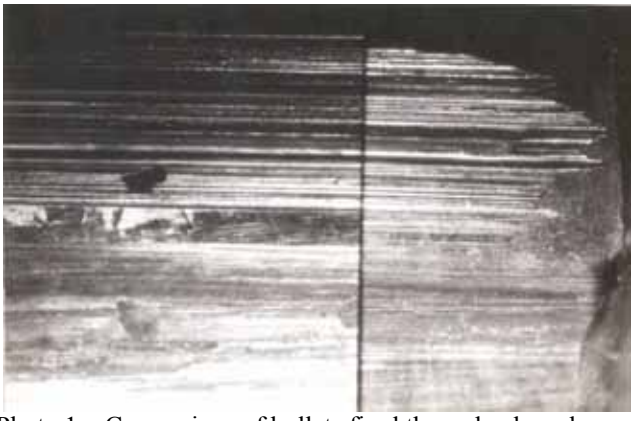


Photo 1: Comparison of bullets fired through a barrel scribed by John Matthews

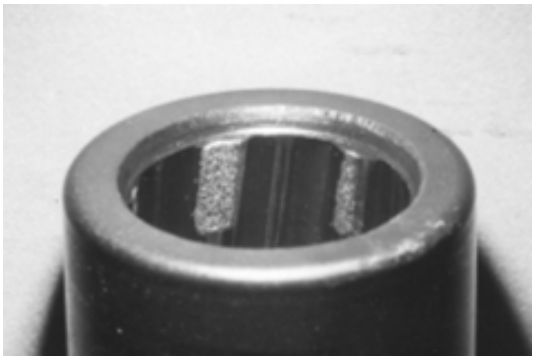


Photo 2: The Miami Barrel with ESRM

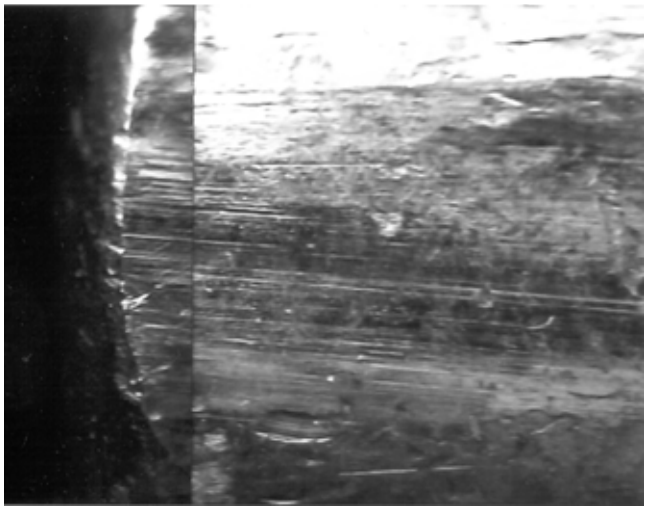


Photo 3: Comparison of bullets fired through ESRM barrel

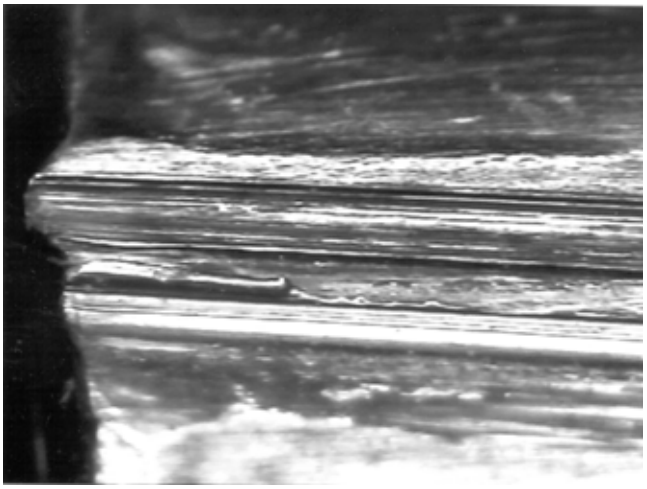


Photo 4: Bullet depicting toolmark imparted by chisel-like tool

Photo #5: 40 S&W Glock barrel,
serial number L20075,
rounds #26 and #27

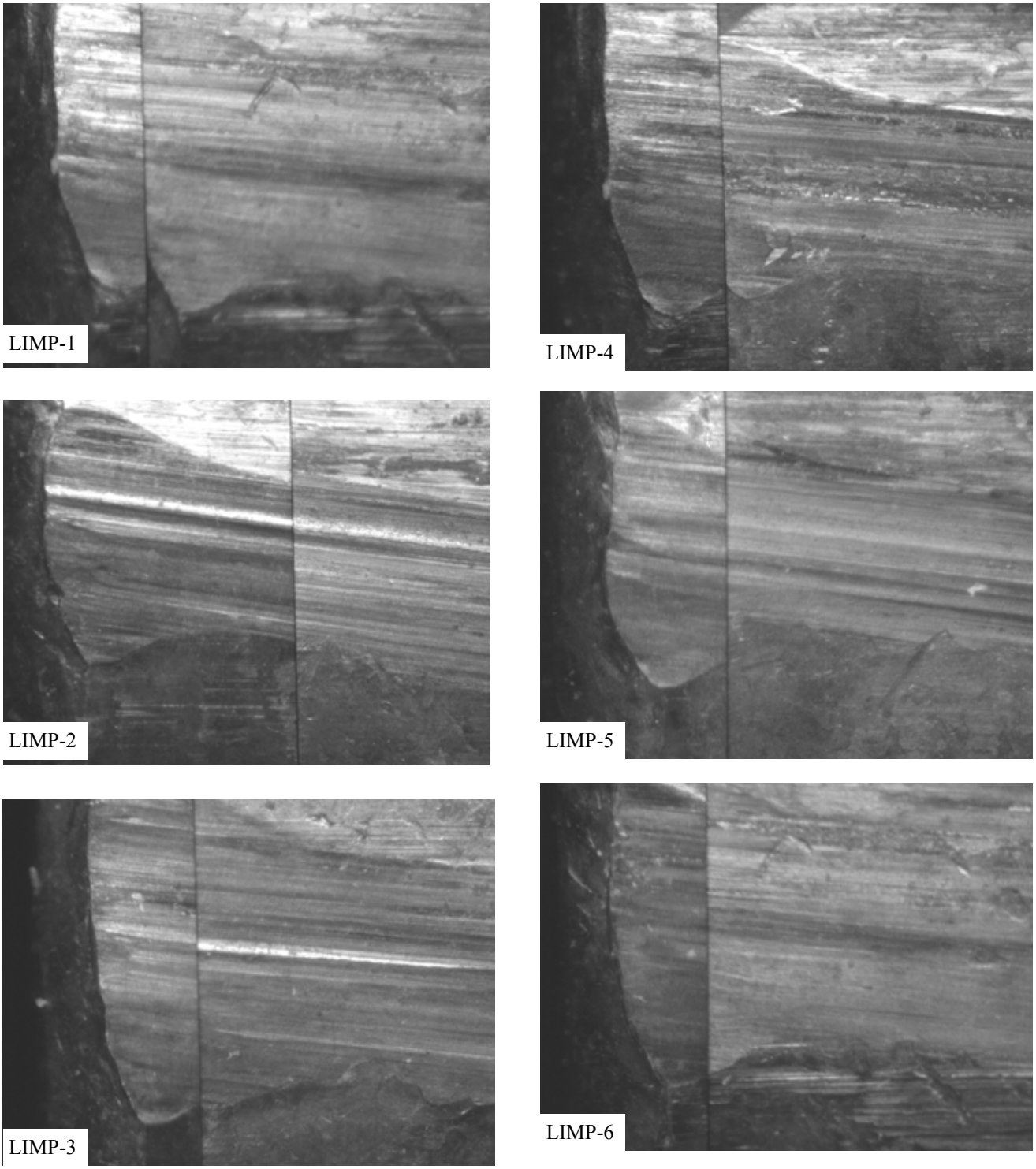


Photo 5: Six land impression comparisons deemed not readily identifiable

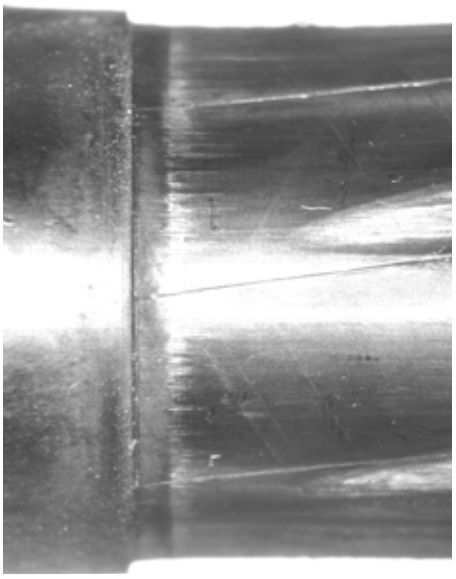
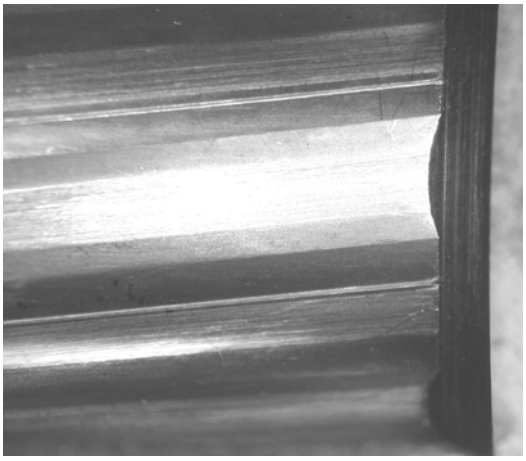


Photo 6: Cross section of barrel.



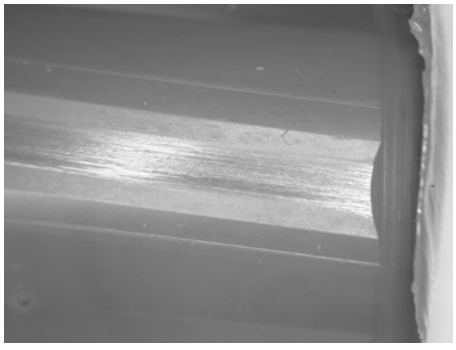


Photo 7: Cross section of barrel and cast at muzzle end

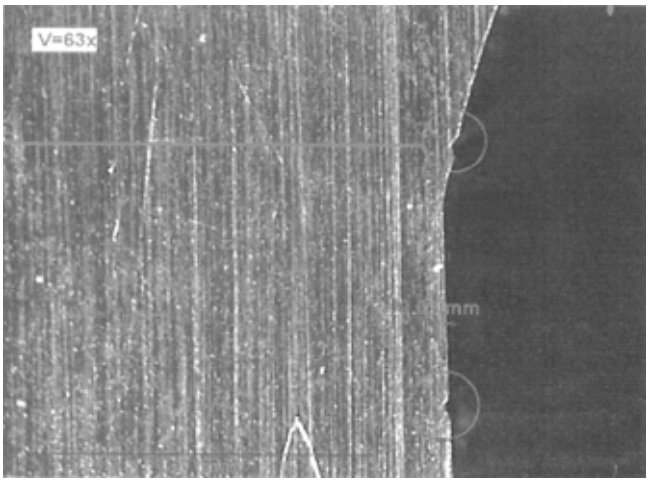


Photo 8: Cut in barrel produced by Glock tool

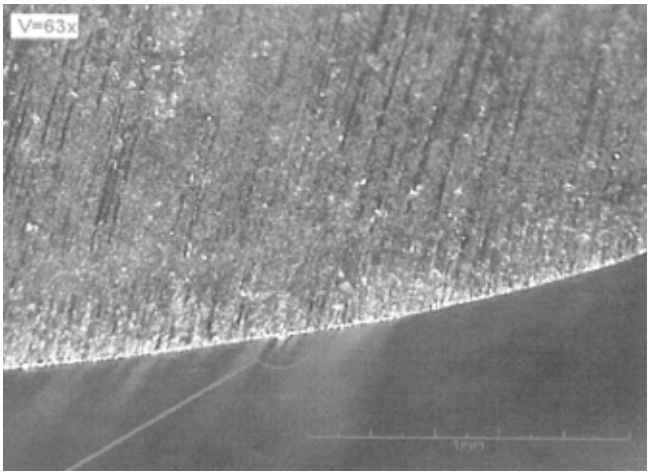


Photo 9: Mark left in bullet from cut in Photo 8

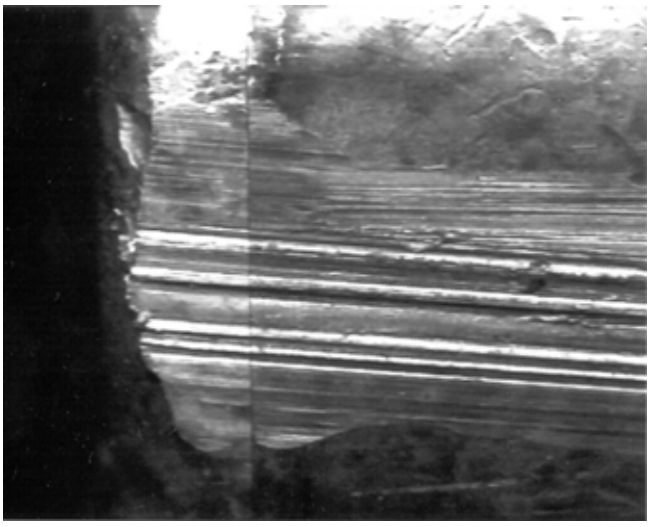


Photo 10: Gross marks, example of subclass characteristics in phase

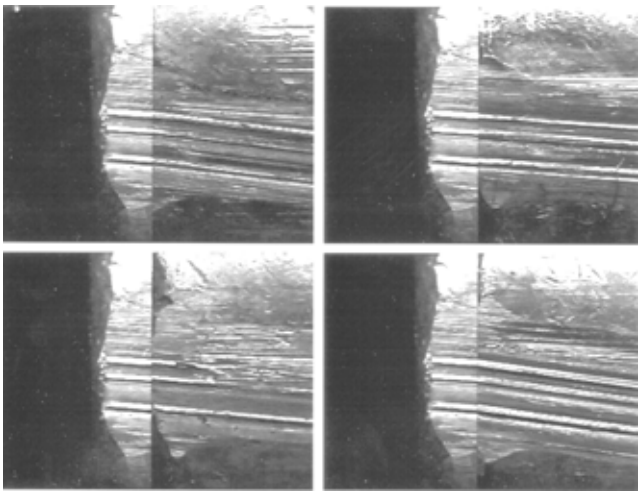


Photo 11: Gross mark comparisons, different land impressions within same barrel

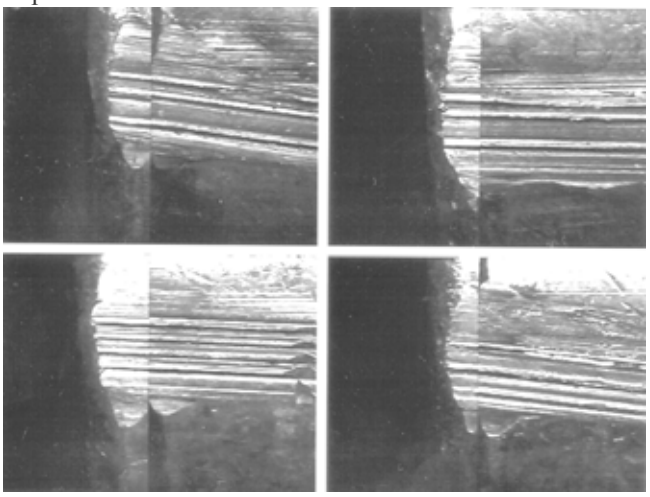


Photo 12: Gross mark comparisons, of two different barrels

Photo 13: Example of an identification

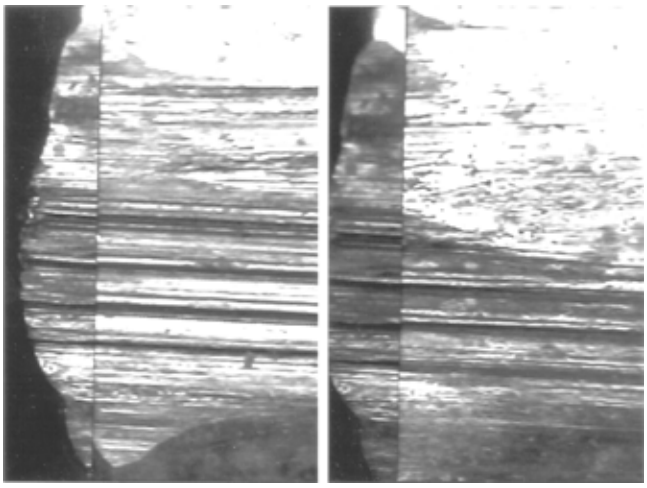


Photo 14: Comparison reference Barrel L21753: left side is bullets 26 & 27, on the right is bullets 27 & 250

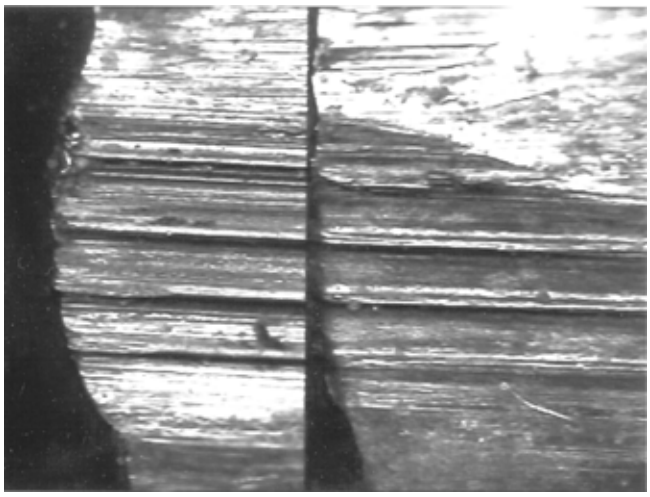
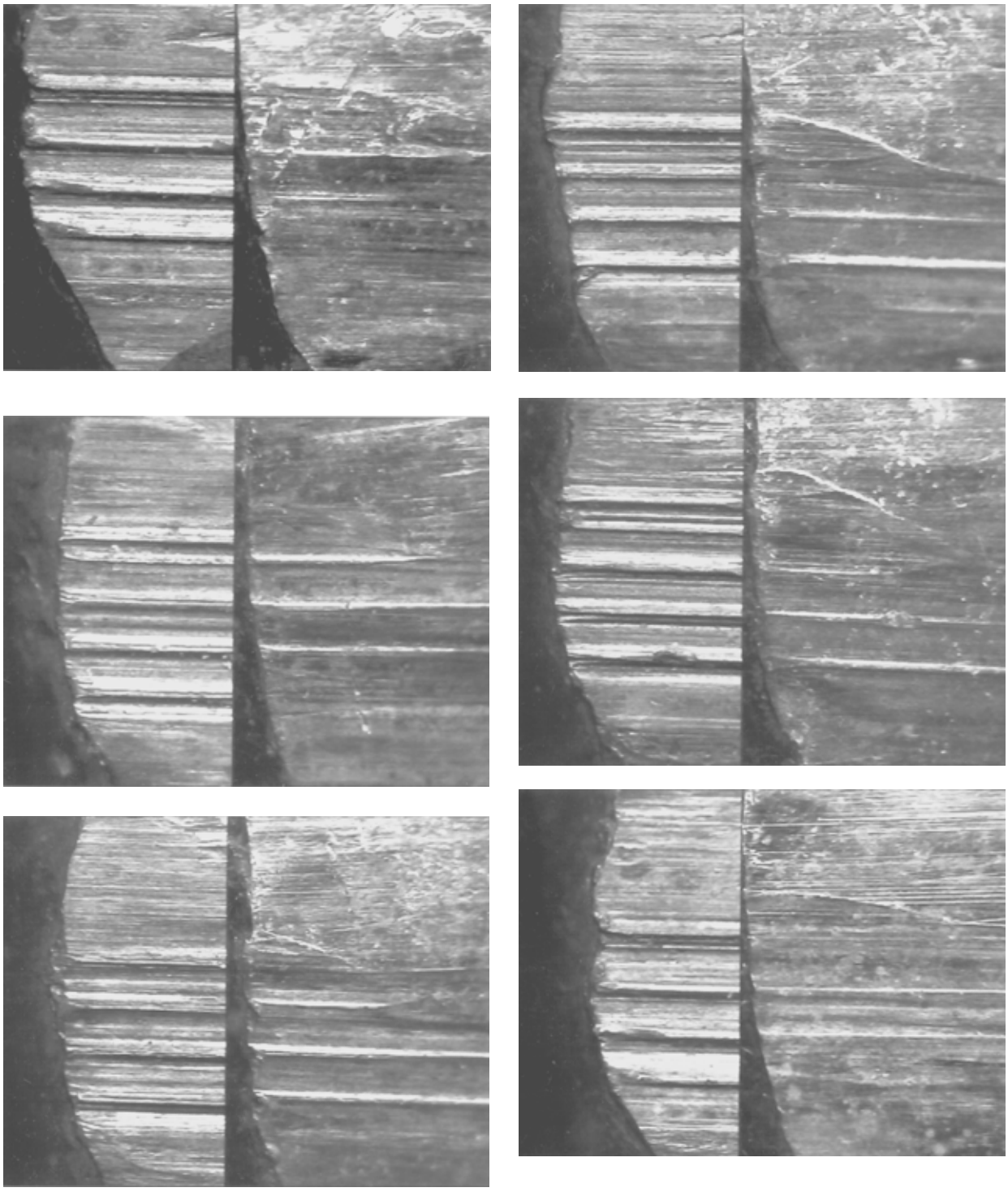


Photo 15: Close up of bullets 27 vs. 250, barrel L21753



Photos 16 - 21: Exhibits the six land impressions of barrel L21753, bullets 27 vs. 3000