

Factors Affecting the Recovery of Latent Prints on Firearms

(This article appeared as a Technical Report in the Mar/Apr 1997 issue of the Journal of Forensic Identification.)

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Introduction

Latent fingerprint examiners generally know that even when cutting edge technology such as cyanoacrylate fuming and laser/forensic light source examination are utilized, successful development of latent prints on firearms is difficult to achieve. In reality, very few identifiable latent prints are found on firearms, a fact that has been discussed in both the literature [1,2,3] and the judicial system [4]. Fingerprint Specialists at the Bureau of Alcohol, Tobacco and Firearms San Francisco Laboratory Center have had, however, some success in this endeavor¹.

In the examination of 1,000 firearms from February, 1992, through August, 1995, 114 identifiable latent prints were developed on 93 firearms. Although successful recovery occurred in approximately one of ten firearms, it should be understood that not all identifiable latent prints may have been left by an offender. Some developed latent prints, for example, are subsequently identified as belonging to a person involved in the collection of the evidence².

Jurors have been inundated with fingerprint information from television, movies and newspapers and feel that latent print evidence is a reliable means of establishing positive personal identity [5]. However, jurors are generally under the impression that every item that is touched by fingers or palms will be left with an identifiable latent print impression [6]. If an offender is arrested for possession of a firearms, jurors therefore expect his/her prints to be on it. In fact, most of the time, fingerprint specialists find no identifiable latent prints on firearms. Accordingly, attorneys often call on the fingerprint specialist to explain to the jury the many reasons for the absence of identifiable latent prints. The following reasons make latent print recovery from firearms difficult and when they are recovered, the time of deposition can seldom be determined. The purpose of this paper is to provide information to both technical and non-technical users of fingerprint identification services about what factors affect the recovery of latent prints on firearms.

Life of latent prints

Unless there is a witness to the offender handling the firearm, there is no way of knowing when the firearm was touched by him/her. It could be days, months, or years since the firearm was handled by the offender.

Professor Andre A. Moenssens has studied latent print age determination extensively. He stated at the 57th Annual Conference of the International Association for Identification (Milwaukee, WI, 1972), "I would simply say that I cannot tell with any degree of precision because there is no known way to

determine positively, or to even closely approximate by opinion testimony, the length of time a latent has been on an object. You can sometimes establish the length of time a print has been on an object circumstantially, but not scientifically”[7].

Charles R. Midkiff has examined the results of tests done by others. He states “from studies and cases examined, it is apparent that wide variations exist in the ability of a latent print to survive, even under rather harsh conditions. Development of a latent print at a crime scene is no guarantee of its having been recently placed. In addition, the studies suggest that no reliable indication of a print's freshness can be obtained from its rate of development or appearance after it is developed. Speculation or court testimony concerning the time when a latent print was placed may be hazardous to the reputation of the examiner”[8].

Atmospheric conditions

Air, temperature, and water all have an effect on the survivability of latent prints, and their subsequent development. Moderate air currents will cause gradual evaporation of the water portion of perspiration, while stronger winds will cause rapid evaporation, but may have little immediate affect on the remaining salts, amino acids, fats and lipids.

Air temperature and the temperature of the surface receiving the latent print can also affect the latent impression. If the surface is hot, it may cause rapid evaporation. A cold surface can eventually create condensation, as in the case of a glass of cold water on a warm day. And generally, less perspiration is secreted during low temperatures.

High humidity can cause moisture to condense on an object's surface, possibly causing the latent deposits to wash away. Low humidity will cause rapid evaporation of the water portion of perspiration because of the lack of moisture in the air.

Rain, of course, will wash away non--fatty/oily deposited latent print. material adhering to an object's surface. Dew and snow, much like rain, will adversely affect the latent print. Not only will they combine with the water in perspiration to dilute the latent print residue, but they may form a barrier between the surface and the friction ridge skin. This barrier may prevent residue from being left in sufficient quantity to be detected [7,9].

Environmental factors

What happens to the firearm between the time a latent print is deposited and the time the weapon is recovered can greatly affect the processing outcome. Placing firearms in holsters, in the waist--band of trousers, between car seats, and under mattresses, to give a few examples, may cause the latent prints to rub off. Latent prints on firearms that are thrown from moving vehicles onto roadways, dusty fields, and into rapidly--running rivers, etc., may also be obliterated. Offenders have also been known to wipe off the interior and exterior parts of firearms, thereby eliminating any chance of developing identifiable latent prints.

Damage of friction ridge skin

Friction ridge skin can be damaged permanently or temporarily, depending on the circumstances of the trauma. Permanent damage can occur because of scarring or disease (e.g. dissociated ridges or dysplasia). Temporary damage is usually due to superficial burns, warts, and occupational situations (e.g. construction workers who handle drying material such as lime, plaster, or cement or dish washers

whose hands are continually wet). All of the above examples will cause the donor to leave very poor or unidentifiable latent fingerprints.

Perspiration

Considering perspiration alone, the amount transferred from the skin to the object touched is the main factor bearing on the identifiability of latent prints. Perspiration excreted from the fingers and palms is reported to contain from 98.5 [10,11] to 99.5 [12,13] per cent water, and 0.5 to 1.5 per cent solid matter. There may be insufficient perspiration to which developing agents can adhere, either because there was little initial perspiration on the skin or because one or more objects were handled prior to the evidence being handled. When sufficient perspiration accumulates on the skin, it should yield a clear impression to which developing reagents will adhere. The anxiousness or nervousness of the individual may also have an effect on the secretion of perspiration through the pores.

Processing problems

Firearms can be difficult to process due to various reasons such as the condition of the metal and the limited smooth area available for processing (most firearms have few smooth surfaces, although an auto loading pistol generally has more processing area for latent prints than a revolver). In addition, more and more guns, like the Glock pistols, are being produced using polymers instead of metal. These polymer parts usually have textured surfaces that are not conducive to the retention of latent prints.

Fingerprints can also become superimposed or smudged because of the way a firearm is handled, or because the surface is dirty, oily, or greasy [14]. Usually, the investigator must touch the same areas of the firearm as the offender in order to unload it safely. While many investigators wear gloves when handling evidence, it has been suggested by some that they should not, "but must become accustomed to work in such a way that they do not leave their own prints. If they wear gloves, there is always the risk that they may become careless and destroy prints" [15,16].

The reason for handling a firearm will determine which surfaces are touched. Persons who discharge firearms usually hold them in a conventional manner, as a matter of safety, using the weapon's grips/stock. The wooden or plastic grips/stock of firearms are often serrated in order to provide a non-slip means of holding the firearm to fire it. These uneven surfaces usually yield no identifiable latent prints. On the other hand, a firearm being casually inspected, loaded/unloaded, cleaned, etc., will be handled much differently than one held for firing. In these instances, more of a firearm's overall surfaces are usually handled, resulting in a greater likelihood than identifiable latent prints will be deposited.

Firearm finishes

The type of finish applied to the metal surface of firearms by the manufacturer, gunsmith, or home repair person can have a detrimental affect upon the development of latent prints. For example, latent prints are particularly difficult to develop on the Parkerized finish found on many military firearms. This type of finish is used on firearms to prevent rust. The metal surface is usually sandblasted prior to the Parkerizing process to produce a nonreflective surface [17]. Weapons with chrome, smooth nickel, or stainless steel finishes are better for the recovery of latent prints.

Most of the firearms received at the Bureau of Alcohol, Tobacco and Firearms San Francisco Laboratory Center have been processed by the manufacturer with bluing. The primary object of bluing is to dull the bright color of the barrel and other metal parts [18]. It also helps prevent the metal from rusting. Since perspiration contains 98.5 to 99.5 per cent water, bluing may retard latent prints as well.

When referring to a firearm finish, attorney Richard Dienst stated that firearm “manufacturers such as Intratec advertise and use the slogan ‘as tough as your toughest customer’ and emphasize that the gun’s finish provides an ‘excellent resistance to fingerprints’”[19]. Intratec guns are characterized as having a matte non--glare finish that seldom retains an identifiable latent print. Beretta produces the Model 92F pistol which was adopted by the U.S. Government as the M--0 service pistol. This entire weapon, except the grips, is reported to be covered with a teflon derivative coating for protection and lubrication [20]. Almost everyone is familiar with the non--stick qualities of teflon. Corroded firearm surfaces and badly machined or finished surfaces also make the development of latent prints difficult.

Packaging the firearm

When firearms are submitted to a crime laboratory for latent print examination, a sturdy box with the firearm tied or strapped down to the bottom of the box should be used. Boxes designed specifically to transport and store firearms are available from several vendors⁴. Paper, plastic bags, and foam packing chips tend to smudge latent prints during handling, so whenever possible, the firearm should be shipped in a box that is not packed with these materials in close contact with the firearm surfaces [21].

Summary

There are a number of factors that affect the fingerprint specialist’s ability to recover identifiable latent prints on firearms. These are: the longevity of a latent print due to how it was deposited; atmospheric and environmental condition; perspiration variation; the nature of the firearm’s surface and finish; how the firearm was handled; and packaging. Due to the reasons stated in this article it is difficult to obtain identifiable prints from firearms, but since in the experience of the authors it occurs almost 10 per cent of the time, the attempt should be made.

It is important that fingerprint specialists be able to describe the reasons why, despite their training, experience, and access to state--of--the--art equipment, identifiable latent prints are developed on firearms infrequently. So--called “negative results testimony” can be an important part of the judicial process, as it presents a more complete account of latent print processing and will allow the absence of identifiable latent prints to be put into proper perspective [22].

Acknowledgments

The authors wish to thank A.T.F. Firearms and Tool Mark Examiner John E. Murdock for his assistance.

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* During the preparation of this report for publication in the Journal of Forensic Identification, the JFI editor was informed that Clive A. Barnum, Senior Fingerprint Specialist with the Bureau of Alcohol, Tobacco and Firearms, had died on December 26, 1996. This report serves as only one indication of Mr. Barnum’s dedication to professionalism.

1-The standard approach to latent print processing at the Bureau of Alcohol, Tobacco and Firearms San Francisco Laboratory Center is atmospheric cyanoacrylate fuming, followed by staining with ethyl alcohol-based Rhodamine 6G, and examination with an Omnichrome Laserprint 1000 portable laser. Additional processing techniques can include the following: Coherent 20-watt argon laser; Omnichrome Omniprint 1000 Alternate Light Source; ardrox; ultra-violet light; standard and magnetic fluorescent powders; standard and magnetic black and silver powder; Polaroid high-contrast photography; and crystal violet.

2-Of 114 latent prints developed, 24 were identified as coming from an offender and one was identified as coming from a law enforcement employee. To put the number of identifications in proper perspective, several factors should be considered.

First, the authors' laboratory, one of three regional A.T.F. forensic laboratories, provides forensic services to fourteen western states and the territory of Guam. Since there are no fingerprint files maintained at the San Francisco Laboratory Center, the authors are dependent on federal agents and police officers to submit inked fingerprints or rap sheet information.

In cases where identifiable latent palm prints are developed on firearms, inked palm prints are virtually never submitted for comparison. In most cases where an offender's inked fingerprints are submitted for comparison and not identified, no elimination fingerprints are submitted for comparison. Most unidentified latent fingerprints are submitted to the California Department of Justice for a search of the CAL-ID, and the Western Identification Network (W.I.N.), if appropriate, for a search of the automated latent print system.

3-Dissociated ridges resemble short curved or dotted ridges over an area of the pattern, while dysplasia results in patternless surfaces.

4-Two that the authors are familiar with are: Lightning Powder Company, Salem, OR, (800)852-0300, and Evi-Pac, Phoenix, AZ, (800) 377-0450

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- 17 Olsen, supra note 1, at 416.

(Editor--My apologies to readers of The Print who are also members of I.A.I. and/or the Calif. Div. of I.A.I., as you may have already read this article. However, this thorough and outstanding discussion of this topic should become one of the best read and often cited technical articles in our field. It is thereby reprinted here for any who may have missed it or do not receive the IAI's Journal of Forensic Identification or the state division's Identification Digest. While the authors' data is sufficient in its own right, I would like to add similar results obtained from the Los Angeles Sheriff's Department-Chemical Processing section during a comparable survey. A survey conducted of 1358 firearms processed between Jan '92 and Jul '96 showed 109 cases with prints being obtained. The 8% average of cases with prints varied between the years from a low of 5.75% to a high of 10.6%. I would like to personally complement Darrell on the outstanding article. While Clive was not a member of SCAFO, many of us knew him. On behalf of our Association, I wish to offer our condolences to the Barnum family. Clive will be missed by the many who knew him.)

***This article was reprinted in "THE PRINT"
Volume 13(3) May/June 1997, pp 6 - 9
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