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Forensic investigation of unusual firearms, ballistic and medico-legal evidence

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Introduction

This book mainly discusses various methods employed in possible identification of unusual firearms and various aspects encountered in the field of forensic ballistics. It contains 6 chapters viz.,

- Introduction to unusual firearms,
- Forensic investigation of fired cartridges of unusual firearms,
- Forensic investigation of fired bullets from unusual firearms,
- Forensic investigation of fired shot charge of unusual firearms,
- Unusual firearms and medico-legal evidence, and
- Additional reading.

It is apt that an author who has dedicated 34 years of experience as an expert in the field of forensic ballistics and examined more than 5000 criminal cases wrote the book. It is written in simple English and gives reader a comfortable feel to understand the science of unusual firearms. A collection of various types of non-standard (unusual) firearms have been presented in the book to visualize the reader for better understanding and communication. Various types of homemade firearms and their identification techniques on the basis of traditional as well as some new scientific approaches are presented in the book.

Book review

Use of unusual firearms, constructional features of homemade firearms, caliber designation of unusual firearms; new nomenclatures, etc. explains the constructional/design characteristics of unusual country made firearms. Various parameters such as irregular rifling, varying barrel shape and size, varying bore dimension, varying breech and muzzle diameter, varying chamber shape and size, etc. are discussed in detail in this chapter 1. These features could be highly helpful to the firearm examiners, investigating officers and experts in the field of firearm identification during the process of crime involving firearms and their investigation.The static breech face marks and the sliding breech face marks (or breech scrape marks) explained in the section 2.1, is highly useful to the field experts and crime investigators. If the required breech face marks are not imprinted on the test specimen even after firing 5 or 6 rounds, a modified test procedure such as

i. Taking the breech impression on lead piece by a very light weight hammering,

ii. Low pressure test rounds by removing a portion of propellant charge,

iii. Test fire after removing propellant and the projectile for comparing breech marks on bulged primer cap can be of helpful.

Technique to obtain breech face marks without normal test fire in certain circumstances, where normal test fire is difficult or not possible, illustration of the breech face marks of a DBBL gun on lead specimen compared with the evidence cartridge is a good example to the reader Figure 2.6Though the gun is identified based on breech face marks, it would have been better, if the number of test lead pieces utilized in the work so as to ascertain the reproducibility of marks. Before forming any opinion, it is the examiner to satisfy him/her whether sufficient identifiable or comparable tool marks are available on the test specimen and sufficient agreement of characteristic marks. As the case is pertaining to country made firearms, an experienced expert can quickly arrive at a definite conclusion in majority of cases. Illustration on deceptive striation marks on primer (refer 2.1.2.1) has thrown some light to the examiner on manufacturing marks. These deceptive marks in the form of parallel striations on the firing pin in Figure 2.8are not repeated in the test fired cartridge. The source of deceptive marks on the evidence cartridge was later confirmed to be originated from the primer seating punch during the process of manufacture. Other forms of deceptive marks due to cartridge tampering, breech scrape marks, partial sliding marks are also discussed in this chapter. The author also warns the examiner to exercise caution during the process of establishing linkage of evidence cartridge with firearm. The breech-cartridge comparison in Figure 2.11 is a good work. However, the figure does not illustrate the numbering done on the photograph with footnote, which may enlighten the reader with much more clarity. Discussions on 2.2 chamber marks, 2.3 firing pin marks, 2.4 extractor and ejector marks are though specific to particular cases, the detailed discussion on the procedures described in the book gives a wide insight by suitably applying modified procedures to identify homemade firearms. The second part of chapter 3 covers identification procedures, which can be considered to be the back bone of this book as it forms the core content of firearm identification. In any crime involving firearms, it is the discharged projectile (bullet or shot charge) causes damage to the target and occupies more important place in criminal investigation. Further, the recovery of fired bullet or shots/pellets from a scene of crime or from the body of victim is/are subjected to identification of its origin of barrel so as to link the chain of events leads to establish the firer of the gun at the time of incidence.

Comparison of class characteristics of an undersized barrel is very difficult. Whereas, comparison of individual characteristics is easy and more reliable in firearms having under sized rifled barrels. In excessively oversized rifled bore (3.1.2.2), it is usually not possible to identify fired bullets in respect of excessively oversized rifled firearms. The text content in this topic is very little and more relevant text to support the conclusion would find a better place for the above conclusion. Hence, the reader may end in an abrupt closing of a discussion. Discussions on modified chamber, irregular rifling and mismatched firearm-cartridge combinations give some idea about homemade firearms. Section 3.2 is an important text content of this whole book with respect to its topic on unusual firearms. The barrel marks of smoothbore firearms on rifled ammunition is discussed elaborately incorporating various types of characteristic smooth bore barrel marks which is highly needed for the forensic ballistics expert to deal with similar situations.

Typical marks illustrated with photographs here is an added advantage to the reader. For new and unfamiliar personnel of forensic ballistics, this chapter can give them an in-depth outline about the barrel marks of unusual firearms. In 3.2.2.1.5, 'bullets without striations or carrying faint striations pose additional identification problems' and it becomes necessary to ascertain whether the evidence bullet has ever been fired from a firearm or not. But, it is to confirm first, whether it is possible to fire a bullet through aoversized barrel, where the fired bullet cannot have the imprint of barrel marks on the bullet's surface in its travel through entire length of the barrel of smooth bore. This situation appears to be hypothetical and must be confirmed with the findings of test experiments sufficiently to support the statement. In that case, the axis of the bullet while seating in the chamber and the barrel axis are in identical coaxial line such that the fired bullet passes through the smooth bore barrel without making any contact with the inner surface of the barrel and exited through the muzzle end of barrel. Other related aspects such as obturation, expansion of gas pressure have no effect on the bullet travel axis within the barrel length. A thorough study on this issue may give some scientific reasoning to ascertain whether or not the fired bullet carry the scratch marks of barrel inner side in certain conditions of smooth bore unusual firearms. The fired bullet may not carry barrel marks (refer to sections 3.1.3 and 3.2.1.2.1) in the following circumstances,-

a. If the axis of the loaded bullet coincided with the axis of the oversized rifled bore.

b. If the loaded bullet is coaxially aligned with the axis of smooth bore barrel, which may not, touch the sides of the barrel during its entire passage through the bore and the barrel is usually short.

The author explains reasons for above two occasions that includes inappropriate modified chamber, versized bore of rifled or smooth bore firearms, coaxial bullet-bore alignment and usually short barrel. But in section 3.1.2.2, it appears that the author modified the statement in respect of excessively oversized rifled bore, the fired bullet may carry discontinuous and overlapping striations, which are not repetitive and hence, usual procedure of firing test bullets for comparison and opinion cannot be adopted. The reader may get into ambiguous state to assign the parameters to categorize a firearm barrel as 'oversized' and 'excessively oversized'. Also it appears that there is no remedy given in the text to assess the axis and coaxial bullet-bore alignment during these circumstances even though discussions on coaxial and non-coaxial are appearing in 3.2.1. Hence, it is highly desirable to have the solution for its assessment. The detailed assessment under 3.2.2, concludes chamber alignment deduced from barrel marks on fired bullet.

The procedure described in 3.2.3 is highly significant in case of identification of unusual non-standard firearms. It elaborates various methods which are certainly possible by a trained ballistics expert to employ these methods in establishing the linkage or elimination of particular firearm (non-standard) from a fired bullet. Due to non-uniformity in homemade firearms, the fired bullet may not be suitable to adopt traditional procedures used in forensic science laboratories. Sometimes, these types of firearms can fire a single or couple of rounds and render unserviceable after its use. Hence depending upon the type and condition of firearm, the ballistics expert may adopt a suitable scientific method to establish a linkage or elimination. Origin of characteristic striations of firearm and method of possible comparison are nicely delivered.

Fired shot(s) through unusual firearms are discussed in chapter 4. Any conclusive opinion on the basis of dispersion of powder residue and/or shots is to be carefully employed as the behavior of dispersion phenomena differs in case of typical unusual firearms. Dispersion of pellets and possible misleading range determination are highly informative and new to fresher, trainee forensic scientists, students. Discussions on identification of barrel marks by adopting modified procedures, such as

a. Pushing an oversized cylindrical lead slug from breech to muzzle to obtain full barrel marks and

b. Firing a cylindrical lead slug (in a standard 12 bore cartridge) through the unusual firearm to obtain full barrel marks for comparison, are highly impressive.

The deliberations given in this chapter 4.2 will definitely explore the scientific community to think of adoptable scientific approach to solve a given case of unusual firearm identification within possible limits. Column and row explanation in section 4.3 will give reader a new insight to ascertain with a reasonable limit the number of possible shots fired through a shotgun. Through sodium rhodizonate test, the arrangement of shots can be identified. Dispersion of wads, wads at scene of crime, flight of closing disks/cushion/sealing wads, plastics wads, unusual barrel marks on wads, unusual chamber marks on wads etc. and reconstruction of shooting incidents can help the examiner, academician and students for refreshing and understanding the subject. The caution is "a positive match establishes linkage; dissimilar marks do not lead to conclude otherwise". Chapter 5 discusses a very important aspect of ballistics on firearm injuries of unusual firearms. Though firearm injuries usually handled by a medico-legal expert, sometimes the forensic ballistics expert can play an active role to assist the investigating agency in proper collection of ballistics evidence and its forensic analysis. Author gives a detailed information of medico-legal evidence of unusual firearms outlining the major areas such as

Shape and size of the bullet hole,

- Close range phenomena,
- Abraded and dirt collar
- Probable caliber of bullet and type of firearm from bullet hole,
- Entry hole and direction of fire
- Projectile-tissue interactions and the track,

- Exit holes and unusual firearms, and
- Wounding effects of fired bullets of unusual firearms.

These discussions can help the experts in relevant field while collecting ballistics evidence and examination of ballistics clue materials in reconstructing the shooting incidents. Further reading in chapter 6 discuss time of firing, evidence of firing, time of firing of firearms, time of firing of fired cartridge and unusual rifling marks on jacket pieces & lead core will enlighten the reader to further expand their knowledge in the field of forensic ballistics. References include 58 citations of books and journals, out of which 34 citations are the published work of author; further strengthens the text book. To suggest for improvement in next edition, figures of country made firearms, bullet/cartridge comparisons, etc. with their relevant parts marked with footnote wherever necessary for more clarity as per discussions in the text would be highly desirable and appropriate. This book covers the major aspects of unusual firearms and relevant examination methodologies in the field of forensic firearm identification. Some of the methods described in the book may be new to many readers. This book can definitely help the practicing firearm examiners, judicial officers, investigating agency, academicians and research students.[1]

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