Association Of Firearms & Tool Mark Examiners

TRAINING MANUAL

March 3, 2001

Introduction

A. Administrative Matters and Procedures

B. Background/History of Firearms Identification and Current Trends

C. Firearms and Ammunition Development and Current Trends

D. Manufacture of Modern Firearms

E. Manufacture of Modern Ammunition

F. Instrumentation

G. Examination of Firearms

H. Bullet Examinations and Comparisons

I. Cartridge/Cartridge Case Examinations and Comparisons

J. Shotshell/Shotshell Component Examinations and Comparisons

K. Gunshot Residue Examinations and Distance Determinations

L. Toolmark Examinations and Comparisons

M. Serial Number Restoration

N. Research Project, Report Writing, Expert Testimony and External Laboratory Review and Tours

INTRODUCTION

The following syllabus will allow you as an examiner trainee to guide yourself through the various areas of knowledge integral to the field of firearms/toolmark identification. This syllabus is generic in its layout and allows some modification by the individual training officer or section chief to meet local conditions. It is paramount that you keep before you the primary and ultimate objective of this training period: to independently and competently examine and compare evidence relating to firearms and toolmark identification; to independently and competently render an opinion and reach conclusions relating to your examinations and comparisons; and to give expert testimony in court in matters encompassed within the broad definition of firearms/toolmark identification and to do this in a professional, competent and an impartial manner. The obligation is yours to maximize on the effectiveness of the training period as an opportunity to learn everything possible in this field. The extent to which you exert yourself during this training and evaluation period will bear directly on the quality of your performance in the laboratory and on the witness stand. Note well that your technical abilities and your testimony will, in turn, bear directly on the future situations of accused persons, and especially in the discipline of firearms/toolmark identification, the lives of accused persons can hang in the balance. You have a moral and ethical obligation to prepare yourself technically and professionally during training in order to be able to perform according to the most rigid standards.

You will be expected to carry out a study of all pertinent section equipment, the Technical Protocol Manual, Administrative Procedures Manual, the Quality Assurance Manual, the Safety Manual, as well as print, video and physical reference files. Integral to your course of study will be frequent daily contacts with section personnel with special expertise in certain areas. Do not hesitate to ask anyone a question, whether a technician, examiner or section chief.

Your study will include many printed references, including the basic material listed after each area of study. It is expected that during the training period that you will become thoroughly familiar with these basic references. Further, it should be noted that you should not restrict your efforts and research to those basic references. One of your primary sources of additional information will be the Firearm Section reference library. Familiarize yourself with the library's contents of all types, including the reference files, related indices, manufacturers' literature and the journal of the Association of Firearm and Tool Mark Examiners.

It is required that you keep a loose-leaf notebook of your study notes on each of the items shown in the syllabus for research, discussion, demonstration, study or practical work. Your notebook can include handwritten notes, charts, graphs, photographs, brief photocopied material, etc., at your discretion, but it must address and broaden on each of the required items of study set out in the syllabus. Organization of your notebook in a format that parallels the syllabus is suggested. This notebook will serve as a ready reference in the months and even years following your qualification, and will assist in documenting your progress during training.

A research project or projects, in addition to certain collateral duties assigned as a learning experience may supplement your training syllabus. You should be prepared to discuss your preferences in regard to a project or projects and collateral duties with your training officer within thirty days after physically reporting to the section.

This training syllabus provides a framework for addressing the most important part of your training: Preparing you to independently and competently examine firearms/toolmark related evidence and independently and to competently reach conclusions and render opinions concerning your examinations and comparisons. This on-the-job, hands-on experience is the core of your training and you will be assigned to work with a training officer during your training period. This will insure that you have sufficiently covered each aspect of this training syllabus and have a basis for continuing to develop after you have graduated beyond your initial qualification and certification.

Your training will be monitored and assisted by your Training Officer, who have responsibility for training matters. All outside schools, tours, lectures and the training officer will coordinate contacts. Within sixty days of physically reporting to the section you should have completed pertinent sections of this training syllabus and you should be sufficiently knowledgeable about section operations and reference files to conduct tours of the section. This aspect of your training should also be coordinated with the training officer.

The Laboratory Director, Firearm Section Chief and/or your Training Officer will interview you in detail after you report to the section. They will be particularly concerned with you past training, experience, education, published articles and other credentials so that they may establish a base line in regard to your knowledge, skills and abilities with regard to the examiner position. Based on this information an Individual Training Plan (*ITP*) will be prepared for you which will contain projected completion dates for the established training goals. You will receive a copy of this ITP for your information and guidance. You will be expected to meet the standards set by your Training Officer for your successful completion of your training. These standards are set forth in the Administrative Guide as well as in your ITP.

A. ADMINISTRATIVE MATTERS AND PROCEDURES

1. Discuss the laboratory Quality Assurance Program and the Proficiency Testing Program with your Laboratory Director/ Firearm Section Chief.

_____ _____
Lab Director/Section Chief Date

2. Discuss the laboratory policy regarding the reexamination of evidence with your Laboratory Director/Section Chief.

_____ _____
Lab Director/Section Chief Date

3. Discuss the opportunities for advancement within the Firearm Section and the laboratory system with your Lab Director/Section Chief.

_____ _____
Lab Director/Section Chief Date

4. Meet with the Lab Director and discuss the laboratory's mission, organization and capabilities. Tour the facilities and prepare a typed summary for your training officer regarding what you learned.

_____ _____
Lab Director/Section Chief Date

_____ _____
Training Officer Date

5. Participate in a one week "*ride-along*" program with a crime scene evidence processing section. Observe the collection and preservation of physical evidence of all types, with emphasis on firearms-related evidence. Prepare a typed report for each day, citing crime scenes observed, evidence collected and the related crime scene search documentation generated, such as photographs, sketches, evidence logs, incident reports, etc.

_____ _____
Crime Scene Supervisor Date

_____ _____
Training Officer Date

6. Discuss with your Lab Director/Section Chief the laboratory policies regarding the following:

   a. Providing telephonic results prior to issuance of a final laboratory report.
   b. Inquiries from the press and other media.
   c. Request to give a deposition in a criminal case.
   d. Request to testify in a civil case.
   e. Request to testify in a grand jury proceeding or a preliminary hearing.
   f. Providing a laboratory report to other agencies.

_____ _____
Lab Director/Section Chief Date

7. Become familiar with the requirements and the facilities available for the secure storage of evidence within the section. Discuss this with the Lab Director/Section Chief and an examiner from the section.

_____ _____
Lab Director/Section Chief Date

_____ _____
Student Date

8. Become familiar with the requirements of section security in regard to firearms, electrical appliances, evidence while under examination, and section space security. Discuss this with the Section Chief and an examiner from the section.

_____ _____
Lab Director/Section Chief Date

_____ _____
Student Date

9. Familiarize yourself with the Firearms Reference Collection (FRC):

    a. Learn how to locate firearms in the FRC using the FRC printed inventory listings, and obtain up-to-date copies of this inventory for your use.
    b. Know the correct procedure for checking a firearm out of the FRC.

    _____ _____
    Lab Director/Section Chief Date

    _____ _____
    Student Date

10. Be briefed by the Section Chief in regard to his files, records and procedures in regard to delinquent cases, annual and sick leave, time and attendance, report files, ordering expendable supplies, purchase orders and obtaining necessary tools, equipment and protective clothing.

    _____ _____
    Lab Director/Section Chief Date

    _____ _____
    Student Date

11. Know the procedures utilized in the firearm section for handling and examining evidence that may be or is known to be infected by the AIDS virus or other diseases.

    (*Use Training Assignment #1 to complete this objective*.)

    _____ _____
    Student Date

12. Obtain a copy of the "*Technical Protocols for Handling of Firearms and Ammunition*" which includes safety rules and procedures. Familiarize yourself with its content and indicate you understand the rules and procedures contained therein by your signature below.

    (***Use Training Assignment #1 to complete this objective*.)**

    _____ _____
    Student Date

    _____ _____
    Training Officer Date

REFERENCE MATERIALS
ADMINISTRATIVE MATTERS

The following reference materials serve several purposes:

- to provide a wider range of resources for use in completing pre-course assignments should you have a particular interest in a given topic.
- to provide reference materials for your future professional use.
- to allow you to gain additional depth in particular subject areas.

Should you encounter other references in this category, you are encouraged to make additional notes about them at the end of this listing.

Basic

Policies and procedure manuals for the laboratory

Firearms Safety

Dutton, G., "Firearms Safety in the Laboratory", AFTE Journal, 1997; 29(1):37-41.

National Laboratory Center, Bureau of Alcohol, Tobacco and Firearms, "Firearms Safety Guidelines for the Forensic Firearms Examiner," current edition.

Chemical Safety

Material Safety Data Sheets (MSDS), as applicable can be obtained in print or on disk from chemical supply houses.

National Laboratory Center, Bureau of Alcohol, Tobacco and Firearms, "National Laboratory Center Safety Procedures Manual," current edition.

Occupational Safety and Health Administration, 29 CFR Part 1910, Occupational Exposures to Hazardous Chemicals in Laboratories; Final Rule.

Biohazards

Bigbee, P.D., "Collecting and Handling Evidence Infected with Human Disease-Causing Organisms," FBI Law Enforcement Bulletin, Jul. 1987.

---. The Law Enforcement Officer and Aids, U.S. Government Printing Office, current edition.

FBI Laboratory, Bloodborne Pathogen Exposure Control Plan, current edition.

Occupational Safety and Health Administration, Bloodborne Facts Hepatitis B Vaccination Protection for You, current edition.

---. Bloodborne Facts - Holding the Line on Contamination, current edition.

---. Bloodborne Facts - Personal Protective Equipment Cuts Risk, current edition.

---. Bloodborne Facts - Protect Yourself When Handling Sharps, current edition.

---. Bloodborne Facts - Reporting Exposure Incidents, current edition.

---. 29 CFR Part 1910.1030, Occupational Exposure to Bloodborne Pathogens; Final Rule, current version.

"AIDS/HIV Carriers, An Organizational Response" FBI Law Enforcement Bulletin, June 1989.

Personal Protective Equipment

Ball, P. and Mikko, D., "Protective Optics," AFTE Journal, 1992; 24(1):80-81.

Occupational Safety and Health Administration, Hearing Conservation, current edition.

---. Personal Protective Equipment, current edition.

---. Respiratory Protection, current edition.

Lead Poisoning

Cayton, J.C., "Blood Lead Tests," AFTE Journal, 1975; 7(1):40.

Geibel, J., "Ammunition Can Be Hazardous to Your Health (In More than the Obvious Way)," Police and Security News, May-Jun. 1992, p. 11.

Gregory, A.M., "At Close Range," American Society of Law Enforcement Trainers Journal, Vol. 4, No. 2.

Martinez, A.M., "Lead Poisoning," FBI Law Enforcement Bulletin, Aug. 1993, pp. 1-4.

Occupational Safety and Health Administration, Standards for Occupational Exposure to Lead, Chapter XVII, Title 29, U.S. Department of Labor, Section 1910.1025.

"Publication Availability: Lead Poisoning in Shooting Range □ A Menace or a Hoax," AFTE Journal, 1980; 12(4):101.

Physical Plant Safety

Occupational Safety and Health Administration, 29 CFR 1910.155, Fire Protection Regulations, Subpart L.

Quality Assurance

Association of Firearms and Tool Mark Examiners, "Association of Firearm and Tool Mark Examiners Quality Assurance Program □ 1986," AFTE Journal, 1986; 18(3):10.
Bradford, L.W., "Barriers to Quality Achievement in Crime Laboratory Operations," AFTE Journal, 1983; 15(2): 71.

---. “Forensic Firearms Identification, Competence or Incompetence,” AFTE Journal, 1979; 11(2):12.

Brundage, D.J., “Proficiency Testing in Illinois,” 1980; 12(4):76.

Hodge, E.E., “Guarding Against Error,” AFTE Journal, 1988; 20(3):290-293.

---. “Guarding Against Error,” AFTE Journal, 1989; 21(2):450-453.

Serrill, M.S., “Forensic Sciences: Overburdened, Underutilized,” AFTE Journal, 1980; 12(4):58.

Lucas, D.M., “American Proficiency Testing Program,” AFTE Journal, 1985; 17(1):26.

“Proficiency Testing Recommended for Crime Labs,” AFTE Journal, 1979; 11(2):22.

Thornton, J.I., “Nationwide Crime Laboratory Proficiency Project,” AFTE Journal, 1979; 11(2):23.

Individual Certification

Kopera, J., “Summary of the Study of the Feasibility of Certification,” AFTE Journal, 1992; 24(1):84-90.

Kowalski, K.F., “AFTE Certification Program,” AFTE Journal, 1996; 28(4):287-290.

Laboratory Accreditation

American Society of Crime Laboratory Directors, Laboratory Accreditation Board Manual, current edition.

Rabren, C.L., “Laboratory Accreditation,” AFTE Journal, 1982; 14(3):36.

AFTE History and Development

“Association of Firearm and Tool Mark Examiners Bylaws,” AFTE Journal, 1990; 22(1):61-70.

Howe, W.J., “Report on the Formation of the Association of Firearm and Tool Mark Examiners,” AFTE Journal, 1989; 21(2):118-119.

Ethics

“AFTE Code of Ethics,” AFTE Journal, 1991; 24(3):342-345.

“AFTE Code of Ethics,” AFTE Journal, 1993; 25(1):ix.

“AFTE Procedures for Enforcement of the Code of Ethics,” AFTE Journal, 1990; 22(4):457-470.

B. BACKGROUND/HISTORY OF FIREARMS IDENTIFICATION AND CURRENT TRENDS

1. Define the following terms:

   a. Firearm identification
   b. Ballistics

   (*Use Training Assignment #1 to complete this objective*.)

   _____ _____
   Training Officers Date

2. Read the applicable sections from the basic references and prepare a report on the history, principles, evolution and scope of firearms identification in its broadest sense. Support your report by data accumulated in your notebook. Discuss this with the Training Officer from the section who will review your report.

   (*Use Training Assignment #1 and #2 to complete this objective*.)

   _____ _____
   Training Officer Date

3. Formulate an answer to the following questions:
   a. Is the Forensic Science Discipline of Firearm and Toolmark Identification an art or science?
   b. What are the types of conclusions that can be reached in firearm identification comparisons?
   c. What is the basis for each of the above conclusions?
   d. Is it possible for experts in the Forensic Science Discipline of Firearm and Toolmark Identification to disagree regarding their conclusions? Why or Why Not?
   e. How does "probability" relate to firearm identification?

   (*Use Training Assignment #2 to complete this objective*.)

   _____ _____
   Training Officer Date

4. Familiarize yourself with the "*Association of Firearm and Tool Mark Examiners*" (*AFTE*), to include its history, current officers, criteria for membership, committees, the AFTE glossary and the AFTE journal and be able to discuss them.

   _____ _____
   Training Officer Date

5. Discuss with system operators the status of the ongoing research initiatives to link shootings using computer imagery such as NIBIN (National Integrated Ballistics Information Network-formerly DRUGFIRE and IBIS). Prepare a report on this system.

   _____ _____
   Training Officer Date

6. Visit and tour the various laboratories that provide firearms and toolmark examinations within your region. Coordinate this visit with your Training Officer.

_____ _____
Training Officer Date

7. Become knowledgeable about the proficiency-testing program administered by the outside independent testing services. Particularly be aware of testing and the results of testing conducted within the field of firearms and toolmark identification by this organization. Discuss this with your Training Officer.

_____ _____
Training Officer Date

8. Be able to demonstrate a practical working knowledge of firearm terminology using the AFTE Glossary as the standard.

(*Use Training Assignment #4 and #5 to complete this objective*.)

_____ _____
Training Officer Date

9. Select a topic for a research project to be completed during your training period. Obtain approval from your Training Officer before initiation of the project. This project should contribute to the overall fund of information in the field of firearm identification. These results will be shared with the section upon completion. In addition, your results should be formatted for publication in the AFTE Journal and for presentation at an AFTE Meeting.

(*Use Training Assignment #3 to begin this objective*.)

_____ _____
Training Officer Date

REFERENCE MATERIALS
FIREARMS IDENTIFICATION - HISTORY, PRINCIPLES, EQUIPMENT AND CURRENT DEVELOPMENTS

The following reference materials serve several purposes:

- to provide a wider range of additional resources should you have a particular interest in a given topic.
- to provide reference materials for your future professional use.
- to allow you to gain additional depth in particular subject areas.

Should you encounter other references in this category, you are encouraged to make addtional notes about them at the end of this listing.

BooksBooks

Association of Firearm and Tool Mark Examiners Standardization Committee, Glossary of the Association of Firearm and Tool Mark Examiners, 3rd edition, Available Business Printing, Inc., Chicago, 1994.

Burrard, G., The Identification of Firearms and Forensic Ballistics, 1st edition,Charles Scribner Sons, NY, 1934, revised edition, A.S. Barnes & Co., NY, 1964.

Davis, J.E., An Introduction to Tool Marks, Firearms and the Striagraph, Charles C. Thomas, Springfield, IL, 1958.

Gunther, J.D., and Gunther, C.O., The Identification of Firearms, John Wiley and Sons, Inc., New York, 1935.

Hatcher, J.S., Hatcher's Notebook, Military Service Publishing Company, Harrisburg, PA, 1947.

---. Firearms Investigation, Identification and Evidence, and Textbook of Pistols and Revolvers, Small Arms Publishing Company, Plantersville, SC, 1946.

Hatcher, J.S., Jury, F.J. and Weller, J., Firearms Investigation, Identification and Evidence, 2nd edition, Stackpole Books, Harrisburg, PA, 1957.

Himmelwright, A.L.A., "Forensic or Legal Ballistics" in Pistol and Revolver Shooting, The Macmillan Company, NY, 1928.

Heard, B.E., Handbook of Firearms and Ballistics: Examining and Interpreting Forensic Evidence, John Wiley & Sons, New York, 1997.

Mathews, J.H., Firearms Identification, Volumes I - III, Charles C. Thomas, Springfield, IL, 1962.

NRA Firearms Fact Book, 3rd edition, National Rifle Association, Fairfax, VA, 1989.

Rowe, W. H., "Firearms Identification", Forensic Science Handbook, Vol. II, 1988, Saferstein, R. (Ed.), Prentice Hall, Englewood Cliffs, NJ, pp. 393 – 461

AFTE Journal

AFTE Criteria For Identification Committee Report, “Theory of Identification, Range of Stria Comparison Reports and Modified Glossary Definitions”, 1992; 24(3)

Barrett, M.R., “Microchip and the Bullet: A Vision of the Future, 1991; 23(3): 876-883.

Bates, J.S., “Investigation of the Assassination of President John F. Kennedy,” 1981; 13(1):64.

Berg, S.O., “Drama of Forensic Ballistics,” 1979; 11(3):44.

---. “Firearms Evidence and the Kennedy Assassination,” 1970; 2(2):2-3.

Beck, R., “Alexander von Inostranzeff and the Technical Development of Optical Comparison Systems,” 1989; 21(1):67-72.

Biasotti, A.A., “Bullet Bearing Surface Composition: Variables: Fired Bullets,” 1981; 13(2):94.

---. “Characteristics in Firearms and Toolmark Identification,” 1980; 12(4):81.

---. “Firearms and Toolmark Identification: A Forensic Science Discipline,” 980;12(3):12.

---. “Methods Applied to the Comparison of Class and Individual Characteristics in Firearms and Toolmark Identification,” 1989; 21(2):260-263.

---. “Photomicrography and Illumination: Some Critical Factors,” 1979; 11(4):60.

---. “Proposal for a Computer Based Firearms Class Characteristics Information System,”1970; 2(1):12.

Biasotti, A.A. and Murdock, J., “State of the Art of Firearm &Toolmark Identification, “ 1984; 16(4):16.

Blackwell, R.J., and Framan, E.P., “Automated Firearms Identification System (AFIDS) Phase I,” 1980; 12(4):11.

Bradford, L.W., “Forensic Firearms Identification: Competence or Incompetence,” 1979; 11(2):12.

Brent, W., “Proved Guilty by Ballistics (Hadley vs Arizona),” 1973; 5(6):5.

Byron, D., “Computerized System for Identifying Firearms,” 1982; 82(3):157.

Cassidy, F.H., “Information on History of Comparison Microscopes,” 1989; 21(1):67-72.

Chamberlain, D., “Microscope Comparison Bridge,” 1972; 4(1):9.

Collins, J.M., “IBIS Manual Bullet Acquisition: Mounting Stub Modification, “ 1997;29(1):70-72.

Crossman, E.B., “Qualifications of a Ballistics Expert,” 1985; 17(3):119.

Dillon, J.H. and Sibert, R.W., “FBI Laboratory’s DRUGFIRE Program,” 1990; 22(2) :216.

Gardner, G.Y., “Computer Identification of Bullets,” 1979; 11(2):26

Garland, P.V., “Reexamination of Firearms Evidence in the Robert F. Kennedy Assassination,” 1976; 8(3):complete issue.

Garrison, D.H., “Guns of Brownsville,” 1986; 18(4):65.

---. “Gunsmith and the Soldier”, (Churchill vs. Burrard), 1987;
19(2): 181-187.

Goddard, C.H., “Criminal Investigation Laboratory as an Aid to Law Enforcement in the Far East,” 1985; 17(3):100.

---. “Firearms as Evidence,” 1980; 12(4):93.

---. “History of Firearms Identification,” 1980; 12(4):38.

---. “History of Firearms Identification,” 1985; 17(1):55.

---. “History of Firearms Identification,” 1989; 21(2):263-278.

---. “History of Firearms Identification to 1930,” 1993; 25(3):214-228.

---. “Identification of Projectiles in Criminal Cases,” 1987; 19(4):393-402.

---. “Scientific Identification of Firearms and Bullets,” 1979; 11(4):97.

---. “Valentine Day Massacre: A Study in Ammunition Tracing,” 1980; 12(1):44.

Goebel, R., “Comparison SEM First Experiments in Forensic Application,” 1983; 15(2):47.

Grove, C.A., Judd, G, and Horn, Horn, R., “SEM: A New Technique for Firearms Examination,” 1972; 4(1):19.

Hall, A.L., “Missile and the Weapon,” 1980; 12(4):85.

Howe, W.J., “Report on the Formation of The Association of Firearm and Toolmark Examiners,” 1989; 21(2):118-119.

Hueske, E.E., “Preliminary Report on the Application of Fiber Optic Videomicroscopy to Firearm and Toolmark Examination,” 1990; 22(3):280-287.

Inbau, F.E., “Scientific Evidence in Criminal Cases: Firearms Identification - □Ballistics’,” 1981; 13(2):75.

---. “Scientific Evidence in Criminal Cases: Firearms Identification -Ballistics,” 1989; 21(2):280-293.

Juling, R.J. and Stern, W.W., “Overview of Firearms Identification Evidence for Attorneys, I. Salient Features of Firearms Evidence,” 1981; 13(4): 128.

Katterwe, H., “Comparison Scanning Electron Microscope,” 1983: 15(3):141.

Lambert, R.R., “Firearms Identification,” 1971; 3(3):23.

Lansing, J.F., “Customized Comparison Microscope,” 1973; 5(5):25.

Lee, H.C., “Firearm Related Evidence: The Nicola Sacco and Bartolomeo Vanzetti Case,” 1985; 17(3):13.

Lawyers Cooperative Publishing Co., “Firearms Identification AM JUR PROOF OF FACTS,” 1983; 15(3):31.

Lutz, M.C., “Consecutive Revolver Barrels,” 1970; 2(5):24.

---. “Evaluation of New Fiber Optics System,” 1986; 18(1):12.

Mann, M., Espinoza, E.O., and Scanlan, M.D., “Firearms Examinations by Scanning Electron Microscopy: Observations and An Update on Current and Future Approaches, “ 1992; 24(3): 294-303.

Masson, J.J.,.“Confidence Level Variations in Firearms: Identifications through Computerized Technology,” 1997; 29(1):42-44.

Matty, W., “Comparison of Three Individual Barrels Produced from One Button Rifled Barrel Blank,” 1985; 17(3):64.

---. “Comparison of Three Individual Barrels Produced from One Button Rifled Barrel Blank,” 1989; 21(2):370-374.

Meyers, C.R., “Firearms and Toolmark Identification: An Introduction,” 1993; 25(4):281-285.

---. “Objective vs. Subjective Boondoggle,” 1987; 19(1):24-30.

---. “Objective vs. Subjective Boondoggle,” 1989; 21(2):413-419.

---. “Mythical Striation Match,” 1992; 24(4):364-365.

Miller, J., “Book Review: The Law and Forensic Ballistics by T.A. Warlow,” 1997; 29(2):239, 173.

Molnar, S., “Comparison Scope Effects Simulated by Use of Photography,” 1971; 3(3):18.

---. “What is a Firearms Examiner: Some Provocative Thoughts,” 1970; 2(7):36.

---. “What is a Firearms Examiner: Some Provocative Thoughts,” 1989; 21(2):128-131.
Moran, B., “Building an Inexpensive High Intensity Fluorescent Lighting System for the Comparison Microscope,” 1997; 29(1):49-54.

---. “Manual and Automated Bullet and Cartridge Case Comparison Systems: A Commentary,” 1997; 29(1):55-57.

Murdock, J.E., “Effect of Crowning on Gun Barrel Individuality,” 1970; 2(3):12.
---. “Forensic Examination of Firearms and Ammunition,” 1987; 19(2):188-197. (Lecture by Robert Churchill Feb. 25, 1931.)

---. “Gun Barrel Individuality and Button Rifled .22 Caliber Rifle Barrels,” 1981; 13(3):84.

Ogihara, Y., “5000 Consecutively Fired Bullets and Cartridge Cases from .45 Caliber M1911A1 Pistol,” 1983; 15(3):127.

Ogihara, Y., Kubota, M., Sanada, M., Fukudo, K., Uchiyama, T., and Hamby, J.E., “Comparison of 5000 Consecutively Fired Bullets and Cartridge Cases from a .45 Caliber M1911A1 Pistol,” 1989; 21(2):331-343.

Prieto, M.A., “Firearms Identification Preface”, 1982l, 14(2): 17- 43.

Rathman, G.A., and Ryland, S.G., “Use of the SEM-EDXA as an Aid to the Firearms Examiner,” 1987; 19(4):338-392.

Starrs, J.E., “Once More Unto the Breech: The Firearms Evidence in the Sacco and Vanzetti Case Revisited: Part I,” 1987; 19(1):37-60.

---. “Once More Unto the Breech: The Firearms Evidence in the Sacco and Vanzetti Case Revisited: Part II,” 1987; 19(1):61-89.

Thornton, J.I., “Origin of the Term Land,” 1983; 15(4):8.

---. “Some Historical Notes on the Comparison Microscope,” 1978; 10(1):7.

---. “Some Historical Notes on the Comparison Microscope,” 1989; 21(2):215-217.
---. “Validity of Firearms Evidence,” 1979; 11(2):16.

Thomas, F., “Striation Matching and Forensic Firearms Identification,” 1980; 12(3):31.

Thompson, R.M., Desrosiers, M., and Hester, S., “Computerized Image Analysis for Firearms Identification: The Integrated Ballistic Identification System: IBIS,” 1996; 28(3):194-203.

Uchiyama, T., “Automated Landmark Identification System,” 1993; 25(3):172-196.

---. “Automatic Comparison Model of Land Marks,” 1988; 20(3):252-259.

---. “Change of Rifling Marks of the Bullets Fired from a Revolver,” 1986; 18(4):40.

---. “Correction: Automatic Comparison Model of Land Marks,” 1990; 22(3):346.

---. “Criterion for Land Mark Identification,” 1988; 20(3):236-251.

---. “Criterion for Land Mark Identification Using Rare Marks,” 1988; 20(3):260-268.

---. “Similarity Among Breech Face Marks Fired from Guns with Close Serial Numbers,” 1986; 18(3):15.

Uchiyama, T., Igarashi, N., and Nagai, M., “Frequency of Occurrence of Individual Characteristics of Firearms on Fired Bullets,” 1988; 20(4):376-390.

Williams-Sorenson, “Barrel Corrosion and Its Effect on Identification,” 1971; 3(2):34.

Ziegler, P.A., “Examination Techniques: The Beam Splitter and Reverse Lighting,” 1983; 15(2):37.

Professional Journals

Belveal, D.N., "Firearms Identification Based Upon Bullet Comparisons: Expertise or Guesswork," California Attorneys for Criminal Justice Forum, Vol. 4, No. 2, Mar. - Apr. 1977, p. 17.

Biasotti, A. A., "A Statistical Study of the Individual Characteristics of Fired Bullets, "Journal of Forensic Sciences, Vol. 4, No. 1, Jan. 1959, pp. 34 - 50.

---. "The Principles of Evidence Evaluation as Applied to Firearms and Tool Mark Identification," Journal of Forensic Sciences, Vol. 9, 1964.

Blackwell, R., "Automated Firearms Identification System (AFIDS)," JPL Report SP 43-8: Phase I, July, 1974.

Brackett, J. W., "A Study of Idealized Striated Marks and their Comparisons Using Models," The Journal of Forensic Science Society, Vol. 10, No. 1, Jan. 1970, pp.27 - 55.

Burd, D.Q., and Kirk, P.L., "Tool Marks. Factors involved in Their Comparison and Use as Evidence," Journal of Criminal Law and Criminology, Mar. - Apr. 1942.

Burrard, G., "The Identification of Fire-Arms in Murder Cases," Game and Gun, Vol. 10, No. 92, May 1933, pp. 214 -219.

Buxton, J.T., "The Science of Ballistics: Judicial Applications," Law Notes, Vol. 34, May 1930, pp. 24 -28.

Cassidy, H.E., "Ballistics Forensically Applied," Journal of Criminal Law and Criminology, Vol. 20, Nov. 1929, pp. 439-448.

Churchill, R., "The Forensic Examination of Firearms and Projectiles, " The Police Journal, Vol. 2, Jul. 1929, pp. 367 -380 (London).

Crossman, E.C., "Some Questions Not in the Program," The American Journal of Police Science, May - Jun. 1930.

Davis, J.E., "The Striagraph: A New Police Science Instrument," Police, Nov. - Dec. 1956, pp. 26 - 29.

Goddard, C.H., "Evidence in Shooting Cases," Chicago Police Journal, Nov. 1913.

---. "Forensic Ballistics," Army Ordnance, Nov. - Dec. 1925.

---. "Scientific Identification of Firearms and Bullets," Journal of Criminal Law and Criminology, Aug. 1926.

---. "The Valentine Day Massacre: A Study in Ammunition Tracing," The American Journal of Police Science, Vol. 1, 1930, pp. 60-79.

---. "Firearms as Evidence," The American Journal of Police Science, Vol. 2, 1931, p. 3.

---. "A National Firearms Bureau," Chicago Police Journal, Jul. 1934, pp. 15-16.

---. "In Search of the Firearm," Chicago Police Journal, Part I, Jan. 1935;
Part II, Feb. 1935.

---. “A History of Firearm Identification,” Chicago Police Journal, 1936, pp. 1-14.

Dougherty, P.M., “Report on Two Early United States Firearms Identification Cases,” Journal of Forensic Sciences, Vol. 14, No. 4, Oct. 1969, pp. 453-459.

“A Federal Firearms Identification Bureau,” editorial in Army Ordnance, Vol. 14, May - Jun. 1934, p. 365.

Grove, C.A., Judd, G., and Horn, R., “Examination of Firing Pin Impressions by Scanning Electron Microscopy,” Journal of Forensic Sciences, Vol. 17, No. 4, 1972, pp. 645-658.

---. “Evaluation of SEM Potential in the Examination of Shotgun and Rifle Firing Pin Impressions,” Journal of Forensic Sciences, Vol. 19, No. 3, 1974, pp. 441-447.

Gunther, C.O., “Markings on Bullets and Shells Fired from Small Arms,” Mechanical Engineering, 54, 1932, pp. 341-345.

---. “Markings on Bullets and Shells Fired from Small Arms,” Mechanical Engineering, 53, 1930, pp 107-113.

---. “Markings on Bullets and Shells Fired from Small Arms,” Mechanical Engineering, 52, 1930, pp. 1065-1069.

---. “Principles of Firearms Identification - Fingerprinting Ordnance in the War on Crime, “Army Ordnance, 12, 1932, pp. 339-340.

---. “Principles of Firearms Identification - Further Analysis of Accidental Characteristics, “ Army Ordnance, 13, 1932, pp. 40-43.

Hall, A.L., “The Missile and the Weapon,” The Buffalo Medical Journal, Jun. 1900. (Reprinted in American Journal of Police Science, Vol. 2, 1931, pp. 311-322.)

Hatcher, J.S., “The Identiification of Firearms,” Army Ordance, Vol. 14, Jul. - Aug. 1933, pp. 27 - 32; Vol. 14, Sep. - Oct. 1933, pp. 89-95.

Inbau, F.E., “Firearms Identification □ □Ballistics’,” Journal of Criminal Law and Criminology, Vol. 24, 1933, pp. 825-845.

Judd, G., Sabo, J., Hamilton, W., Ferriss, S., and Horn, R., “SEM Microstriation Characterization of Bullets and Contaminant Particle Identification,” Journal of Forensic Sciences, Vol. 19, No. 4, 1974, pp. 798-811.

Katterwe, H., Goebel, R., and Gross, K.D., “The Comparison Scanning Electron Microscope within the Field of Forensic Science,” Scanning Electron Microscopy/1982, SEM Inc., pp. 499 - 504.

Korda, E.J., Macdonell, H.L., and Williams, J.P., “Forensic Applications of the Scanning Electron Microscope,” Journal of Criminal Law, Criminology and Police Science, Vol. 61, No. 3, 1970, pp. 453-458.

Murdock, J.E., “The Effect of Crowning on Gun Barrel Individuality,” The Journal of the Forensic Science Society, Vol. 12, 1972, pp. 305-308.

Nichols, R.G., “Firearms and Toolmark Identification Criteria: A Review of the Literature”; Journal of Forensic Science, 1997:42(3): 466-474 (contains 35 references)

Peterson, C.A., “A Camera for Bullet Photography,” Chicago Police Journal, May 1934, pp. 7 - 8.

Roche, G.F., “The Use of Photographs in Forensic Firearms Identification,” Identification News, Vol. 3, No. 6, Jun. 1953.

Serhant, J.E., “The Admissibility of Ballistics in Evidence,” American Journal of Police Science, May-Jun. 1930.

Sibert, R. W., “DRUGFIRE: Responding to Gang and Drug-Related Shootings,”, Crime Laboratory Digest, Vol. 19, No. 1, January 1992, pp. 6 - 9

Sibert, R.W., “Drugfire: Revolutionizing Firearms Identification and Providing a National Firearms Identification Network,” Crime Laboratory Digest, Oct. 1994.

Smith, S., “The Identification of Firearms and Projectiles,” The Police Journal, Vol. 1, Jul. 1928, pp. 411-422 (London).

Sullington, D., “Ballistics, a New Science,” The Criminologist, Vol. 5, Jun. 1929, pp. 32-34.

Tangen, E., “The Schopflin Case,” The American Journal of Police Science,” Vol. 2, 1931, pp. 518-528.

“The History of Firearms Identification,” The International Association of Identification Firearms Sub-Committee, Identification News, Vol.15, No. 6, June 1965, pp. 5 – 15

Thomas, F., “Comments on the Discovery of Striation Matching and on Early Contributions to Forensic Firearms Identification,” Journal of Forensic Sciences, Vol. 12, No. 1, Jan. 1967, pp. 1-7.

Thornton, J., “The Validity of Firearms Evidence,” California Attorneys for Criminal Justice Forum, Vol.5, No. 4, Aug. 1978, p. 15.

Wescott, A.P., “The Firearms Expert,” The Police Journal, Vol. 7, Oct. - Dec. 1934, pp. 472-485 (London).

Wiard, S.W., “Ballistics as Applied to Police Science,” The American Journal of Police Science, Vol. 1, 1930, pp. 538-542.

Wiard, S., “Application of Ballistics in Legal Cases,” American Journal of Police Science, Vol. 2, 1931, pp. 174-179.

Wigmore, J.H., “Evidence - Homicide - Identification of Bullet and Firearms,” Illinois Law Review, Vol. 25, 1931, p. 692.

Periodicals

"Art of Photographing the Unseen is Museum-Artgravure Subject," Newark News, Feb. 4, 1934. (Phillip O. Gravelle)

Barton, A., "You Can't Get Away With Murder," Guns, Jul. 1979.

Braverman, S., "Forensic Ballistic Errors," The Gun Digest, 1966, pp. 280-283.

Coggswell, J.F., "Is There a Perfect Crime?," Popular Mechanics, Aug. 930, pp. 194 - 199.

Crawford, W.J., "Bullet Identification," The Edison Monthly, May 1926.

Crossman, E.C., "The Scientific Side of Firearms and Crime," The Sporting Goods Dealer, June 1930.

Dunn, H.H., "Trade-Marks of Crime," Popular Mechanics, Jul. 1929, pp. 50-56.

Goddard, C.H., "Who Did the Shooting?," Popular Science Monthly, Nov. 1927, pp. 21-23.

---. "Forensic Ballistics," Medical Times, Jul. 1929.

---. "Forensic Ballistics - Popular Style," American Rifleman, Vol. 77, Jul. 1929, pp. 14, 15 and 20.

---. "The Bullet and Microscope," The Rifleman, Nov. 1929 (London).

---. "Gang Guns,", American Rifleman, Vol. 78, Jan. 1930, pp. 16 and 38.

---. "How Science Solves Crime: II. Identification of Firearms," Hygeia, Vol. 10, Mar. 1932, pp. 219-233.

Gorman, S.F., "Scientific Criminology - How Bullets and Firearms are Matched for Identification," Scientific American, Oct. 1930, pp. 265-267.

---. "Scientific Criminology - The Pistol Witness," Scientific American, Dec. 1930, pp. 456-457.

"His Camera Sees Where Human Eye Fails," Newark News, Feb. 17, 1941. (Phillip O. Gravelle)

"How the St. Louis Ballistics Expert Operates in His Part of Crime Detection," St. Louis Globe-Democrat, Jul. 14, 1929.

Herrich, R.E., "Ballistic Jusrisprudence," Arms and the Man, May 1923.

Landis, C.S., "Winchester's Ballistic Chief Has Helped to Unravel Many Crime Mysteries," The Sporting Goods Dealer, Nov. 1931.

"A New Way of Examining the Inside of a Rifle Barrel," Scientific American, April, 1926.
"Optics and the Dectective," Bausch and Lomb Magazine, Jul. 1925.

Pardua, R., "What's in a Name....Ballistics for Instance," Spring 3100, a Magazine for Policemen, Vol. 22, No. 2, (NYCPD).

Souder, W., “Firearm Identification,” Army & Navy Journal, Mar. 1932.

“South Orange Man is Awaitng Medal for Photomicrography,” Newark News, Jun. 24, 1924 (Phillip O. Gravelle).

Stout, W.S., “Fingerprinting Bullets - The Expert Witness,” The Saturday Evening Post, June 13, 1925.

---. “Fingerprinting Bullets The Silent Witness,” The Saturday Evening Post, June 20, 1925.

“Photomicrography Authority Started Career as Hobbyist,” Newark News, Feb. 16, 1936. (Phillip O. Gravelle)

“Photomicrography Expert to Address Camera Club,” Newark News, Jan. 25, 1934. (Phillip O. Gravelle)

Teale, E.W., “Secrets of Crime Read on Bullets,” Popular Science Monthly, Feb. 1932.

Thompson, W., “How Who Dunits Are Solved,” Guns Magazine, Aug. 1955.

Williams, C.G., “Fingerprints on Bullets,” Outdoor Life, May 1922.

“Wizard in Ballistics: Phillip O. Gravelle of So. Orange, Expert with Microscope, Dead at 77,” Newark News, Feb. 4, 1955.

Other Documents

“Benchmark Evaluation Studies of the Bulletproof and DRUGFIRE Ballistic Imaging Systems,” Executive Summary, Published by the Executive Office of the Presidents’s Office of National Drug Control Policy

Biasotti, A.A., “Bullet Comparisons - A Study of Fired Bullets Statistically Analyzed,” unpublished Master’s thesis, School of Criminology, University of California, Berkeley, 1955, 97 pages.

Boyd, K.T., “Use of Probability Theory in Making Identifications Through Common Characteristics,” paper presented at AFTE meeting in Washington, D.C., Feb, 1974.

Devaney, J.R., and Bradford, L.W., “Applications of Scanning Electron Microcopy to Forensic Science at Jet Propulsion Laboratory, 1969 - 1970,” Scanning Electron Microscopy/1971 (Part II), proceedings of the Workshop on Forensic Applications of the Scanning Electron Microscope, IIT Research Institute, Chicago, IL, pp. 561-568

Kingston, C.R., and Kirk, P.L., “The Use of Statistics in Criminalistics,” unpublished paper presented at California Association of Criminalists, Fall Seminar, Oct. 1973.

“Study of Fired Bullets and Shells in Brownsville, Texas, Riot.” Annual report of Chief of Ordnance, U.S. Army, Government Printing Office, Washington, DC, 1907.

The Waite System of Bullet Identification (undated pamphlet) Bureau of Forensic Ballistics, New York.

C. FIREARMS & AMMUNITION DEVELOPMENT AND CURRENT TRENDS

1. Review the history of early firearms and ammunition development up to the advent of metallic cartridges, with particular emphasis on lock mechanisms, early rifling techniques, percussion systems, priming methods and pre-metallic cartridges. Prepare a chronological outline of this early development and discuss it with your Training Officer.

   (*Use Training Assignment #3 to complete this objective*.)

   _____ _____
   Training Officer Date

2. Visit the firearm collection of a museum in your region and observe first-hand those firearms that constitute examples of early firearms and ammunition development. Meet the curator of the collection and obtain their views and opinions on those firearms that are developmental benchmarks. Coordinate this tour with your Training Officer and discuss the tour with them afterwards.

   _____ _____
   Training Officer Date

3. Tour the firearms reference collection noting in particular the types of firearms that are representative of commercial and military firearm development since the advent of metallic cartridges.

   _____ _____
   Training Officer Date

4. Trace the evolution of the rimfire cartridge from the mid-nineteenth century to the current generation of modern .22 caliber rimfire cartridges.

   (*Use Training Assignment #4 to complete this objective*.)

   _____ _____
   Training Officer Date

5. Study the history of centerfire cartridge development starting with black powder cartridges to the current generation of modern centerfire cartridges. Make notes to show the chronological history of this development and discuss these with your Training Officer.

   (*Use Training Assignment #5 to complete this objective*.)

   _____ _____
   Training Officer Date

6. Study the Firearm Section Standard Ammunition File (*SAF*) with the Firearms examiner to whom it is assigned, noting in particular cartridges and shotshells that are representative of commercial and military ammunition development during the past three decades.

_____ _____
Training Officer Date

7. Conduct an in depth study of exterior bullet coatings which have been developed in the last decade. Prepare a report concerning how this new technology impacts the firearm examiner.

(*Use Training Assignment #5 to complete this objective*.)

_____ _____
Training Officer Date

8. Obtain a copy of the (most recent) studies concerning cartridge effectiveness conducted by the FBI. Prepare a report listing trends you see unfolding in cartridge and bullet development and show any historical significance to these findings.

_____ _____
Training Officer Date

9. Prepare an overview of the recent development in handguns and how this information might be of significance to the firearm examiner.

_____ _____
Training Officer Date

REFERENCE MATERIALS
HISTORY OF BLACK POWDER AS A PROPELLANT

The following reference materials serve several purposes:

- to provide a wider range of resources should you have a particular interest given topic.
- to provide reference materials for your future professional use.
- to allow you to gain additional depth in particular subject areas.

Should you encounter other references in this category, you are encouraged to make additional notes about them at the end of this listing.

Books

Barnes, Cartridges of the World

Davis, T.L., The Chemistry of Powder and Explosives, reprinted by Angriff Press, Las Vegas, NV (Originally printed as two separate volumes in 1941 and 1943; also reprinted by John Wiley and Sons, New York, 1950.) pp. 1-51.

Munhall and White, Cartridge Headstamp Guide

Periodicals

Brown, M., "America's Gunpowder Maker," American Rifleman, Aug. 1979, pp. 40-43, 81

Harrison, E.H., "Black Powder," American Rifleman, Oct. 1975, p.73.

Lewis, R.B., "Bacon's Thunderous Sound," American Rifleman, May 1952, pp. 35-40.

Ley, W., "Friar Berthold...Man or Myth," American Rifleman, Jul. 1959, pp. 31-34.

Nonte, G.C., "At Last a Black Powder Substitute" in Hogdon's Data Manual No. 23, Hogdon Powder Co., Shawnee Mission, KS, 1977.

"Pyrodex Replica Black Powder," Rifle Magazine, No. 46, p. 18.

Roberts, D., "Dupont - Powder Supplier for a Nation," Rifle Magazine, Jul./Aug. 1973, pp. 36-37, 54.

Silva, E., "The Black Powder Saga," Guns Magazine, Aug./Sep. 1977

AFTE Journal

Dillon, J.H., "Black Powder Background," 1991; 23(2):689-693.

Garland, P.V., "The Augusta Powder Works - A Historical Sketch," 1974; 6(2):8-10.

Rosenberg, S.F., "Good News for the Charcoal Burners, New Source for Black Powder, " 1974; 6(2):13.

Styers, G.R., "History of Black Powder," 1987; 19(4):443-446.

Videotapes

Kaboom! , NOVA/WGBH Boston, 1997. (first twenty minutes)

REFERENCE MATERIALS
EVOLUTION OF EARLY FIREARMS

Books

Association of Firearm and Tool Mark Examiners Standardization Committee, Glossary of the Association of Firearm and Tool Mark Examiners (Appendix F, Firearm Ignition Systems), 3rd edition, Available Business Printing, Inc., Chicago, 1994.

Carman, History of Firearms from Earliest Times to 1914

Chapel, C.E., Guns of the Old West, Coward-McCann, Inc., New York, 1961. (Reprinted by Odysseus Editions, Inc., for the NRA Firearms Classics Library, 1995)

Edwards, Civil War Guns

Fuller, C.E. and Stewart, R.D., Firearms of the Confederacy, Standard Publications, Inc., Huntington, WV, 1944. (Reprinted by Odysseus Editions, Inc., for the NRA Firearms Classics Library, 1996)

Gluckman, U.S. Martial Pistols and Revolvers

Greener, W.W., The Gun and Its Development, Cassel and Company, Ltd., New York, 1910. (Reprinted by Bonanza Books, 1967, and by Odysseus Editions, Inc., for the NRA Firearms Classics Library, 1995)

Held, R., The Age of Firearms - A Pictorial History, Harpers, 1957.

Hogg, I.V., The Story of the Gun from Matchlock to M16 , St. Martin's Press, New York, 1996.

Lewis, Small Arms and Ammunition in the U.S. Service, 1776-1865

Logan, H.C., Hand Cannon to Automatic, Standard Publications, Inc., Huntington, WV, 1944.

NRA Staff, Firearms and Ammunition Fact Book

NRA, Handgun and Shoulder Arms Assembly

Peterson, H.L., Arms and Armour in Colonial America 1526-1783, The Stackpole Co., Harrisburg, PA, 1956.

Peterson, H.L., Encyclopedia of Firearms

Pope, Guns

Roberts, N.H., The Muzzle-loading Cap Lock Rifle, The Clarke Press, Manchester, NH, 1944. (Reprinted by Odysseus Editions, Inc., for the NRA Firearms Classics Library, 1996)

Sharpe, P.B.., The Rifle in America, William Morrow and Co., New York, 1938. (Reprinted by Odysseus Editions, Inc., for the NRA Firearms Classics Library, 1995)

Smith, W.H.B., The NRA Book of Small Arms: Volume II - Rifles, NRA/Military Service Publishing Company, Harrisburg, PA, 1948. (Reprinted by Palladium Press for the NRA Firearms Classics Library, 1997)

Smith, W.H.B., The NRA Book of Small Arms: Volume I - Pistols and Revolvers, NRA/Military Service Publishing Company, Harrisburg, PA, 1946. (Reprinted by Palladium Press for the NRA Firearms Classics Library)

U.S. Cartridge Company, Pictorial History of Firearms to 1905, Normount Technical Publications, Forest Grove, OR, 1971.

Winant, L., Early Percussion Firearms, Morrow Publications,1959.

Periodicals

Peterson, H.L., "The Development of Firearms," American Rifleman, Parts 1 and 2, Mar. and Apr., 1960.

AFTE Journal

Cayton, J.C., "Blackpowder Firearms, Powder Residue & Ball Penetration," 1984; 16(4):80.

Fadala, S., "Penetration of Round Ball," 1988; 20(2):135-139.

George, W., "Black Powder Firearms: Safety Precautions," 1988; 20(1):57-58.

Tschappat, M.G., "Early History of the Ordnance Department," 1988; 20(2):174-184.

Vandiver, J.V., "Foxfire 5 Has Early Gunsmithing Data," 1981; 13(2):15.

Videotapes

Gunsmith of Williamsburg, The Colonial Williamsburg Foundation, Williamsburg, VA, 1969.

Guns of the Civil War, Volumes I & II, Monterey Movie Co., 1993.

The History of Firearms - The Springfield Armory, United States Video Corp., Vienna, VA, 1994.

Muzzle-Loading Basics, Flintlock and Percussion Firearms, Lenny Magill Productions, San Diego, CA.

The Story of the Gun, Volume I and first 38 minutes of Volume II, up to but not including the development of rimfire ammunition, A&E Television Networks, New York,1996.

D. MANUFACTURE OF MODERN FIREARMS

1. Numerous techniques are used in the manufacture of modern firearms. Research in detail these processes and set these out in your notes. Include but do not restrict your study to the following machining methods:

   a. Shaping
   b. Planing
   c. Drilling
   d. Reaming
   e. Turning
   f. Boring
   g. Milling-include both face milling and peripheral (slab) milling
   h. Broaching
   i. Abrasive machining-include honing, lapping, grinding, sanding, and ultrasonic methods
   j. Sawing
   k. Filing
   l. Swaging
   m. Electrochemical machining
   n. EDM
   o. Investment casting

   (*Use Training Assignment #6 to complete this objective*.)

   _____ _____
   Training Officer Date

2. Demonstrate your knowledge of the basic nomenclature of handguns, rifles, and shotguns.

   a. Include but do not restrict your study, to the following: breechface, breech bolt, bolt, bolt face, extractor, ejector, firing pin, rifling, barrel, lands, grooves, ramp, magazine, clip, ejection port, receiver.
   b. Point out these parts in several handguns, rifles and shotguns as applicable.
   c. Discuss the manufacturing techniques that would have been used to fabricate and finish each of the parts and note the machining marks on each part.
   d. Point out any "*mark of abuse*" which could contribute to the uniqueness of each part.
   e. Identify areas that machining marks might "*carry over*" to another firearm.

   (*Use Training Assignment #7 to complete this objective*.)

   _____ _____
   Training Officer Date

3. Research in detail the following rifling techniques:

   a. Broach
   b. Button
   c. Hammer Forging
   d. Hook method
   e. Scrape method
   f. ECM
   g. EDM

   (*Use Training Assignment #8 to complete this objective*.)

   _____ _____
   Training Officer Date

4. Obtain broaches and buttons for study from the section training materials. Determine the difference between barrels, which have been button, rifled and those, which have been broach, rifled.

(*Use Training Assignment #8 to complete this objective*.)

_____ _____
Training Officer Date

5. Discuss and define the following terms as they relate to firearm manufacture or firearms identification.

a. Chambering
b. Crowning
c. Ballizing
d. Bore slugging
e. Forcing cone
f. Bore
g. Choke
h. Choke tubes

(*Use Training Assignment #8 to complete this objective*.)

_____ _____
Training Officer Date

6. Research the history and current significance of proof marks as they relate to the manufacture of firearms. Discuss this with your Training Officer.

(*Use Training Assignment #8 to complete this objective*.)

_____ _____
Training Officer Date

7. Visit the manufacturing facilities of at least six firearms and/or barrel manufacturers such as Wilson barrels, Ruger, Smith and Wesson, Mossberg, Marlin and US Repeating Arms. Record notes in your notebook on each visit and produce a written report of your visit for the Firearm Section files and an oral report for Firearm Section members. Particular emphasis should be placed on manufacturing and rifling techniques used by each manufacturer, noting methods and procedures which leave unique manufacturing toolmarks on firearm parts which, in turn, produce individual microscopic marks on bullets, cartridge cases and shotshell casings. Coordinate these visits with your Training Officer.

_____ _____
Training Officer Date

REFERENCE MATERIALS
MODERN FIREARMS DEVELOPMENT AND OPERATING SYSTEMS

The following reference materials serve several purposes:

- to provide a wider range of additional resources should you have a particular interest in a given topic.
- to provide reference materials for your future professional use.
- to allow you to gain additional depth in particular subject areas.

Should you encounter other references in this category, you are encouraged to make additional notes about them at the end of this listing.

Books

Association of Firearm and Tool Mark Examiners Standardization Committee, Glossary of the Association of Firearm and Tool Mark Examiners (Appendix F, Firearm Ignition Systems), 3d edition, Available Business Printing, Inc., Chicago, 1994.

Brownell, F.R., Encyclopedia of Modern Firearms, Brownell, 1959.

Chinn, G.M., The Machine Gun, Volumes I-IV, U.S. Government Printing Office, 1951-1955.

Ezzel, E.C., Handguns of the World, Barnes and Noble Books, New York, 1993.

---. Small Arms of the World, Barnes and Noble Books, New York, 1993.

Hatcher, J.S., Hatchers Notebook

Hobart, F.W., Pictorial History of the Submachine Gun, Scribners, 1975.

Hogg, I.V., Pistols of the World, Fortress Publications, 1978,

---. Modern Small Arms, Book Sales Inc., Edison, N.J., 1994.

Janes Information Group, Jane's Infantry Weapons, London, current edition.

Johnson, M.M., Automatic Arms: Their History, Development and Use, W. Morrow & Co., New York, 1941.

Johnson, G.B., and Lockhoven, H.B., International Armament, Volumes I-II, International Small Arms Publishers, Cologne, 1965.

Keith, E., Shotguns, Stackpole and Heck, 1950.

Mueller and Olson, Shooters Bible, Small Arms Lexicon and Concise Encyclopedia

Murtz, H.A., ed., The Gun Digest Book of Exploded Long Gun Drawings, DBI Books, Inc., Northbrook, IL, 1993.

---. The Gun Digest Book of Exploded Handgun Drawings, DBI Books, Inc., Northbrook, IL, 1992.

Nelson, T.B., and Lockhoven, H.B., The Worlds Submachine Guns, International Small Arms Publishers, Cologne, 1963.

Nelson, T.B., and Musgrove, D., The Worlds Assault Rifles and Automatic Carbines, TBN Enterprises, 1968.

NRA Fact Book, 3rd edition, National Rifle Association, Fairfax, VA, 1989.

Petzal, D.E., The Encyclopedia of Sporting Arms, Facts on File, Inc., New York, 1991.

Roberts, J.B., ed., Firearms Assembly, the NRA Guide to Pistols and Revolvers, NRA, Fairfax, VA, 1993.

---. Firearms Assembly, the NRA Guide to Rifles and Shotguns, NRA, Fairfax, VA, 1993.

Smith, W.H.B., Small Arms of the World, Stackpole Books, Harrisburg, PA, 1973.

---. Book of Pistols and Revolvers, 7th edition, Stackpole Books, Harrisburg, PA, 1968.

Smith & Smith, The Book of Rifles

Wirnsberger, G., The Standard Directory of Proof Marks, Blacksmith Corporation, Chino Valley, AZ.

Wood, J.B., Firearms Assembly/Disassembly - Part I: Automatic Pistols, DBI Books, Northbrook, IL, 1990.

---. Firearms Assembly/Disassembly - Part II: Revolvers, DBI Books, Northbrook, IL, 1990.

---. Firearms Assembly/Disassembly - Part III: Rimfire Rifles, DBI Books, Northbrook, IL, 1994.

---. Firearms Assembly/Disassembly - Part IV: Centerfire Rifles, DBI Books, Northbrook, IL, 1991.

---. Firearms Assembly/Disassembly - Part V: Shotguns, DBI Books, Northbrook, IL, 1992.

---. Firearms Assembly/Disassembly - Part VI: Law Enforcement Weapons, DBI Books, Northbrook, IL, 1981.

AFTE Journal

Ball, P., “Iraqi Tariq Pistol (7.65mm),” 1993; 25(2): 128-129.

Bell, P.D., and Mikko, D.M., “Iraqi Model 74 Semiautomatic Pistol,” 1992; 24(1) 23-27.

Berg, S.O., “Firearms Safety Design Origins and the Firearms,” 1996; 28(4): 211-221.

---. “Gas Handling, Containment, Deflection and Venting for Bolt Action Rifles,” 1992; 24(4): 375-380.

---. “History of Remington Slide Action Shotguns,” 1988; 20(3): 296-299.

---. “History of Remington Slide Action Shotguns,” 1989; 21(2) :453-457.

---. “History of Revolver Safeties,” 1982; 14(4): 29.

---. “History of Revolver Safeties,” 1989; 21(2): 309-313.

---. “History of the Derringer Pistol,” 1985; 17(3): 91.

---. “Lever Action Firearms Safeties,” 1988; 20(1): 64-71.

---. “Magazine Safeties: Important Safety Design,” 1993; 25(4): 301-307.

---. “Rohm RG Industries Firearms and Safeties,” 1986; 18(2):72.

---. “Safety Design: Remington Semiautomatic shotguns,” 1989; 21(3): 496-499.

Boss, G., “Number One: AK-47 the Most Popular Gun in the World,” 1995; 27(3): 220-221.

Chenow, R.W., “Bauer .25 Caliber Stainless Steel Semiautomatic Pistol,” 1976; 8(4): 20.

---. “Mendoza Model K 62 Single Shot Pistol,” 1980; 12(2): 28.

Dodson, R.V., and Stengel, R.F., “American Derringer,” 1992; 24(1): 63-64.

Dujanovich, M.B., “Heckler & Koch 9x19mm Firearms,” 1995; 27(4): 297-302.

---. “Navy Arms Model TU90 Semiautomatic Pistol,” 1994; 26(2): 121-126.

Fournier, R.J., and Lemmer, J.T., “Type Sugiura: Oriental 32 ACP Pistol,” 1985; 17(2): 38.

Freeman, R.A., “M11/Nine and KG 99 Closed Bolt Semiautomatic Pistols,” 1985; 7(2): 92.

Garland, P.V., “Glock 17 Pistol,” 1987; 19(2): 178-180.

---. “SATA Semiautomatic Pistol,” 1970; 2(7): 23.

---. “SWD, Inc. Model II Semiautomatic Pistol,” 1988; 20(4): 460-461.

---. “Taurus Model 58S Semiautomatic Pistol,” 1988; 20(4): 459.

Garland, P.V., and Lutz, M., “USAF Rifle/SMG,.221 Cal,” 1971; 3(1):24.

Gieszl, R., “Bersa 380 Semiautomatic Pistols,” 1991; 23(3): 862-866.

Gieszl, R., Wolslagel, P., and Nordhoff, T., “Stallard Arms Model JS 9mm Semiautomatic Pistol,” 1990; 22(3): 299-302.

Goodman, R., Santora, D., and Trochum, T., “Kahr K9,” 1996; 28(3): 166-167.

Hawkins, R.R., “Davis Industries Model D-25 Derringer,” 1985; 17(2): 77.

Heflin, T.F., “Marlin 30 Caliber Machine Gun,” 1988; 20(2): 204-205.

Hughes, D.R., “Book Review: The History and Development of the M16 Rifle and Its Cartridge,” 1991; 23(3): 798.

Johnson, T.D., and Matty, W., “Arcadia Machine and Tool: Notes on AMT Firearms,” 1986; 18(3): 69.

Kreiser, M.J., “45-70 Caliber Century Revolver,” 1983; 15(2): 19.

---. “AMT Back-Up Pistol Manufacturer Marking Information,” 1984; 16(3): 20.

---. “Information on Taurus History,” 1982; 14(3): 9.

Laskowski, G.E., “American Industries Calico M-100 & M-100P 22 Long Rifle Carbine and Pistol,” 1988; 20(2): 131-134.

Levine, R.T., “Davis Industries Derringers,” 1990; 22(3): 310-314.

Lutz, M.C., “Smoothbore 38 Special Derringer: Davis Industries Model D38,” 1996; 28(3): 174-176.

---. “Central Kentucky Arms Semiautomatic Rifle,” 1983; 15(4): 40.

---. “Jennings Bryco 59 Semiautomatic Pistol,” 1995; 27(2): 130-132.

Maruoka, R.K., “Beretta Model 92 Compact L,” 1997; 29(1): 14-15.

---. “French Mas Rifle,” 1995; 27(1):17-19.

Matty, B., and Dougherty, P., “Sedco Industries Model SP-22 Pistol,” 1990; 22(2): 195-198.

Mauer, C.C., “Rohm Model 38T Double Action Revolver,” 1970; 2(3): 25.

McBrayer, W.S., “Smith & Wesson Model SW40F,” 1994; 26(4): 297-298.

Mikko, D., “Ceska Zbrojoka (CZ) Model 50 Semiautomatic Pistol,” 1993; 25(4): 264-265.

Moorehead, C.A., and Mauer, R., “AMT Back Up 9mm Kurz (380 ACP) Auto Loading Pistol,” 1985; 17(2): 97.

Nielson, F. I., “Heckler & Koch P7 (PSP),” 1981; 13(4): 37.

Nordhoff, T.J., “Lorcin 25 ACP Caliber Pistol,” 1989; 21(4): 399-400.

---. “Grendel Semiautomatic Pistol,” 1989; 21(4); 609.

---. “Wyoming Arms Parker 10mm S.S. Pistol,” 1990; 22(2): 191-193.

Stanton, R.B., “Bryco Arms Semiautomatic Pistol,” 1990; 22(2): 194.

Stauffer, J.C., “. 38 S&W American Bulldog (Belgium),” 1973; 5(5): 8.

---. “Feather Model AT-9 Semiautomatic Carbine,” 1990; 22(3): 333.

---. “MKA 9mm Semiautomatic Carbine,” 1991; 23(2): 658.

Schubert, K.H., “Technical Note on the Grendel P-30 Pistol,” 1993, 25(2): 108-109.
Sojat, J.G. and Hart, R.P., “Heckler & Koch Model HK-4 Pistol,” 1973, 5(2): 19.

Stengel, R.F., and Dodson, R., “Rohm 41 Magum Model 57 Revolver, 1990; 22(4): 444-445.

Stone, R.S., “Sites Spectre 9mm Semiautomatic Pistol,” 1991; 23(4): 1000-1002.
Templin, R.H., “Jennings, Model J-22 Semiautomatic Pistol Information,” 1987; 19(1) 18.

---. “H&R Military Training Rifle,” 1985; 17(2): 95.

Thorpe, J.C., “Information on the S.W.D., Inc. SMG Production,” 1984; 16(3): 17.

Trumble, C. “Ortgies Pocket Pistols,” 1997; 29(1): 87-92.

---. “Ruger’s Answer to the MP 5,” 1997; 29(1): 80-86.

Thompson,E., “Ares 9mm Folding Machine Gun (FMG),” 1988; 20(2):198.

---. “FMJ 45 Long Colt/.410-Gauge Shotshell Model D Derringer,” 1994; 26(2):144.

--- .”Haskell 45 ACP Semiautomatic Pistol,” 1992; 24(1): 75.

---. “Intratec Tec 22 Scorpion Pistol,” 1990; 22(1): 51-54.

---. “Parker 45 Semiautomatic Pistol,” 1991; 23(3): 859-861.

---. “380 Jennings Firearms Model 59,” 1994; 26(2): 132-133.

---. “9mm Lorcin Semiautomatic Pistol,” 1995; 27(1) 8-10.

Thompson, E., and Qanass, N., “9mm Danshway Semiautomatic Pistol,” 1992; 24(3): 311-313.

Vagnozzi, V., “Information on the M3 SMG Grease Gun,” 1989; 21(1): 74.

Vaughan, R.T., and Gilman, P.L., “Information of the Rogak LES P18 Pistol,” 1985; 17(2):72.

Whitemarsh, J.W., “Jennings Firearms Model J22 Semiautomatic Pistol,” 1985; 17(2): 120.

---. “Jennings Firearms Model J22 Semiautomatic Pistol Information,” 1987; 19(1): 18.

Videotapes

American Gunsmithing Institute (AGI) Armorer's Course videotape series, including the following titles:

Colt 1911 .45 Auto Pistol (111 min.)

Remington 1100 Shotguns (120 min.)

Browning Hi-Power Pistol (97 min.)

Remington 870 Shotguns (95 min.)

AR-15 Rifles (120 min.)

Winchester 94 Rifles (120 min.)

SKS Rifles (120 min.)

Ruger Standard Auto MKI/MKII (90 min)

AKS/MAK 90 Type Rifles (91 min.)

Ruger Mini-14 Rifles (90 min.)

Glock 17,19,21,23 Pistols (60 min.)

Makarov Pistols (60 min.)

H&K Models 91,93,94 Rifles (60 min.)

S&W, 1st, 2nd, 3rd, Generation Pistols (105 min.)

S&W Revolvers (120 min.)

M1 Garand/M1A Rifles (90 min.)

Ruger 10/22 Rifles (60 min.)

Mossberg 500 Shotgun (90 min.)

Beretta 92/Taurus P-92 Pistols (90 min.)

M1/M2 .30 Carbine (90 min.)

FN FAL Rifles (128 min.)

Hi-Standard Auto Pistols (111 min.)

Lenny Magill Productions "Bill Wilson Presents" videotapes series including the following titles:

CZ-75 (72 min.)
Sig Sauer P226 (74 min.)

Lenny Magill productions videotapes under the following titles:

Mastering the AR-15 (120 min.)

Center X M1A/M14 (120 min.)

Mastering Revolvers (70 min.)

Rock'n Roll #1(45 min.)

Complete Ruger P-Series (45 min.)

Rock'n Roll # 2 (50 minutes)

Complete Sigma (45 min.)

U.S. Marines Firepower (75 min.)

Complete Ruger .22 Pistol (67 min.)

Mastering the Mini-Glock (110 min)

U.S. Government training films converted to videotape and marketed by GunVideo, 4585 Murphy Canyon Road, San Diego, CA:

Thompson Sub-Machine Gun (97 min)

Infantry Weapons and Their Effects (30 min.)

Weapons of the Infantry (41 min.)

Fundamentals of Small Arms (30 min.)

B.A.R.-Browning Automatic Rifle (20 min.)

Videotapes from other sources marketed by Lenny Magill Productions under the following titles:

Firestorm (60 min.)	Shooting the Uzi the Israeli Way (70 min.)
Knob Creek Machine Gun Shoot (60 min.)	The Colt M-16 Rifle (20 min.)

Anite Productions, P.O. Box 375, Pinole, CA, videotapes under the following titles:

Deadly Force (100 min.)

Deadly Weapons (106 min.)

Deadly Effects (60 min.)

Dillon Productions, 8009 East Dillon's Way, Scottsdale, AZ. videotape:

Firestorm in the Desert - Machine Gun Magic (117 min.)

A & E Television Networks, 126 Fifth Avenue, New York, NY, videotape series:

The Story of the Gun, Vol. I-IV (50 min. each volume)

Magnum Research, Inc., 7110 University Avenue, N.E., Minneapolis, MN, videotape:

Desert Eagle Pistol and Friends (20 min.)

REFERENCE MATERIALS
MANUFACTURE OF MODERN FIREARMS

Books

Hatcher, J.S., Jury, F.J., and Weller, J., Firearms Investigation, Identification and Evidence, 2nd edition, Stackpole Books, Harrisburg, PA, 1957, Chapters 3-6.

Herb, C.O., Machine Tools at Work, The Industrial Press, New York, 1942.

"Machinery Handbook, 25th Edition"

Mathews, J.H., Firearms Identification, Volume I, Charles C. Thomas, Springfield, IL, 1962, pp. 1-9.

Moltrecht, K.H., Machine Shop Practice Vol 1 & 2

Oberg, Jones & Horton, Machinist's Handbook Revised 21st Edition

"Ruger Investment Casting (Company Brochure)"

Steindler, Firearms Dictionary

Periodicals

Bird, J., "How Handguns Are Made," Handguns, Feb. 1996, pp. 70-73.

"Choke Tube Roundup!" Guns & Ammo, July 1994.

Peterson, H.L., "The Development of Firearms," American Rifleman, Parts 3 and 4, May and Jun., 1960.

Ruger Staff, "Ruger's Gun Talk - Rifled Barrels," Guns and Ammo, Mar. 1997.

Sitton, G., "Blackstar Barrel Accurizing," Guns and Ammo, Aug. 1994.

S & W Staff Report, "How S & W Builds Great Guns," Smith & Wesson Handguns □96, PJS Publications, Peoria, Il. 1996.

Weller, J., "The Quiet Revolution in U.S. Firearms Manufacture, Part 1," American Rifleman, Jan. 1971.

---. "The Quiet Revolution in U.S. Firearms Manufacture, Part 2 - Sporting Rifles," American Rifleman, Feb. 1971.

---. "The Quiet Revolution in U.S. Firearms Manufacture, Part 3 - Shotguns," American Rifleman, Mar. 1971.

---. "The Silent Revolution at Savage and Ithaca Gun Co.," American Rifleman, Nov. 1972.

AFTE Journal

Ball,P., and Mikko,D., “Proofmarks,” 1992; 24(1): 14-15**.**

Biasotti, A. A., “Rifling Methods: Individual Characteristics Produced,” 1981; 13(3):34.

Chenow, R.W., and Lemmer, J.T., “Use of Investment Castings in the Manufacture of Firearm Components,” 1994; 26(1):64-76.

Goddard, C.H., “Proof Tests and Proof Marks,” 1983; 15(2): 116-142.

Haag, L.C., “Heckler & Koch Polygonal Rifling,” 1977; 9(2):45-47.

Harden, L.R., “Rohm Manufacturing Plant,” 1978; 10(1):15.

Lansing, J.F., “Electrochemical Machining: A New Barrel Making Process, Part 2, Testing the Coonan Arms Model B Pistol and the Reproducibility of Rifling Stria,” 1988; 20(4): 396-403.

Papke, R.E., “Electrochemical Machining: A New Barrel Making Process,” 1988; 20(1): 48-52.

Sugarman, L.A., “Eddy Manufacturing Co., Caliber .45 Auto Pistol,” 1982; 14(1): 43.

Swearengen, T.F., “Polygonal Rifling,” 1973; 5(2): 32.

Templin, R.H., “Manufacture of a M10 SMG Receiver,” 1985; 17(2): 110.

Videotapes

Shotguns in Valtrompia, How a Gun is Made (Com Nasce Un’Arma), Consorzio Armaioli Bresciani, Gardone Valtrompia, Italy, 1995 (English version).

E. MANUFACTURE OF MODERN AMMUNITION

1. Define in your notebook and know the meaning of the following terms as they relate to modern ammunition and its manufacture:

a. Cartridge
b. Jacketed bullet
c. Cartridge case
d. Bullet sizing
e. Primer
f. Wadcutter bullet
g. Shotshell
h. Semi-wadcutter bullet
i. Shotshell casing
j. Soft point bullet
k. Bottleneck cartridge
l. Spitzer bullet
m. Rebated-rim cartridge
n. Swaging
o. Rimless cartridge
p. Cast lead bullet
q. Rimmed cartridge
r. Mold marks
s. Semi-rimmed cartridge
t. Truncated-nosed bullet
u. Shoulder
v. Cannelure
w. Neck
x. Ogive
y. Mouth
z. Brass-coated lead bullet
aa. Head
bb. Copper-coated lead bullet
cc. Headstamp
dd. Nylon-coated lead bullet
ee. Proof cartridge
ff. "Silvertip" bullet
gg. Tapered cartridge
hh. Antimony
ii. Extractor groove
jj. Arsenic
kk. Gauge
ll. Chilled shot
mm. Battery cup
nn. High brass, low brass
oo. Brass
pp. Lubaloy
qq. "Rule of 17"
rr. Dram equivalent
ss. Wadding
tt. Single base, double base
uu. Shot collar
vv. Boattail bullet
ww. Crimp
xx. Casting seam
yy. Bunter
zz. Sprue
aaa. Bullet
bbb. Round-nosed bullet

(*Use Training Assignment #9 and Practical Exercise #1 to complete this objective*.)

_____ _____
Training Officer Date

2. Sketch the cross-section of Berdan and Boxer primers, showing their relationship to the head of the cartridge.

(*Use Training Assignment #10 to complete this objective*.)

_____ _____
Training Officer Date

3. Discuss the purpose and essential ingredients of priming mixture used in modern cartridges.

(*Use Training Assignment #10 to complete this objective*.)

_____ _____
Training Officer Date

4. Know and discuss the difference between caliber and caliber type. Illustrate this difference by relating these terms to a discussion of the .22 caliber, .30 caliber and .38 caliber families of cartridges.

(*Use Training Assignment #10 and Practical Exercise #2 to complete this objective*.)

_____ _____
Training Officer Date

5. Visit at least one ammunition-manufacturing facility such as Remington, Federal or Winchester to observe the manufacture of rimfire and centerfire cartridges and shotshells. Make detailed notes of the manufacturing processes and generate a written report for section files. Also, prepare an oral presentation for section members upon your return. Particular emphasis should be placed on pellet and bullet manufacture, shotshell casing and cartridge case manufacture and the steps involved in the loading of cartridges and shotshells. Coordinate this visit with your Training Officer.

_____ _____
Training Officer Date

REFERENCE MATERIALS
MODERN AMMUNITION EVOLUTION AND MANUFACTURE

The following reference materials serve several purposes:

- to provide a wider range of resources should you have a particular interest in a given topic.
- to provide reference materials for your future professional use.
- to allow you to gain additional depth in particular subject areas.

Should you encounter other references in this category, you are encouraged to make additional notes about them at the end of this listing.

Books

ANSI/SAAMI Centerfire Pistol & Revolver Voluntary Performance Standards, Sporting Arms and Ammunition Manufacturers' Institute, Wilton, CT, current edition.

ANSI/SAAMI Centerfire Rifle Voluntary Performance Standards, Sporting Arms and Ammunition Manufacturers' Institute, Wilton, CT, current edition.

ANSI/SAAMI Rimfire Voluntary Performance Standards, Sporting Arms and Ammunition Manufacturers' Institute, Wilton, CT, current edition.

ANSI/SAAMI Shotshell Voluntary Performance Standards, Sporting Arms and Ammunition Manufacturers' Institute, Wilton, CT, current edition.

Association of Firearm and Tool Mark Examiners Standardization Committee, Glossary of the Association of Firearm and Tool Mark Examiners (Appendix F, Firearm Ignition Systems), 3rd edition, Available Business Printing, Inc., Chicago, 1994.

Barnes, F.C., Cartridges of the World, DBI Books, Inc., Northbrook, IL, current edition.

Davis, T.L., The Chemistry of Powder and Explosives, reprinted by Angriff Press, Las Vegas, NV (Originally printed in two separate volumes in 1941 and 1943; also reprinted by John Wiley and Sons, New York, 1950.) pp. 244-330, pp. 400-458.

Frost, G.E., Ammunition Making, An Insider's Story, National Rifle Association, Fairfax, VA, 1990.

"The Ever-changing Shotshell Story," Gun Digest, 1973 edition, DBI Books, Northbrook, IL.

Hackley, F.W., Woodin, W.H., and Scranton, E.L., History of Modern U.S. Military Small Arms Ammunition, MacMillan Co, 1967.

Halsey, A., ed., The NRA Handloader's Guide, National Rifle Association, Washington, DC, 1968.

Handloaders' Bullet Making Annual, Wolf Publishing Co., Prescott, AZ, current edition.

Hatcher, J.S., Hatcher's Notebook, Military Service Publishing Co., Harrisburg, PA, 1947, pp. 300-333.

Hatcher, J.S., Jury, F.J., and Weller, J., Firearms Investigation, Identification and Evidence, 2nd edition, Stackpole Books, Harrisburg, PA, 1957, Chapters 3-6.

Hayes, T.J., Elements of Ordance, John Wiley and Sons, Inc., New York, 1938.

Hoyen, G.A., The History and Development of Small Arms Ammunition, Volumes I-II, Armory Publications, Tacoma, 1981.

The Illustrated Reference of Cartridge Dimensions, Wolfe Publishing Company, Prescott, AZ, 1993.

Labbett, P., Military Small Arms Ammunition of the World 1945-1980

Logan, H.C., Cartridges, A Pictorial Digest of Small Arms Ammunition, Standard Publications, 1948.

"Lyman Reloading Manual"

Mann, F.W., The Bullet's Flight from Powder to Target, Standard Printing and Publishing Co., Huntington, WV. (Reprinted by Palladium Press for the NRA Firearms Classics Library, 1997).

Ohart, T.C., Elements of Ammunition, John Wiley and Sons, Inc., New York, 1946.

SAAMI Publication #200, Smokeless Powder, Sporting Arms and Ammunition Manufacturers' Institute, Wilton, CT.

SAAMI Publication #201, Primers, Sporting Arms and Ammunition Manufacturers' Institute, Wilton, CT.

SAAMI Publication #202, Sporting Ammunition, Sporting Arms and Ammunition Manufacturers' Institute, Wilton, CT.

SAAMI Publication #204, Facts About Sporting Ammunition, Sporting Arms and Ammunition Manufacturers' Institute, Wilton, CT.

SAAMI Publication #226, Ammunition Types and Characteristics - Handguns, Sporting Arms and Ammunition Manufacturers' Institute, Wilton, CT.

Sharp, P.B., Complete Guide to Handloading, Funk and Wagnells, New York, 1937.

---. The Rifle in America, William Morrow & Co., New York, 1938, pp. 28-43.

Simmons, R.F., Wildcat Cartridges, William Morrow & Co., 1947.

"Speer Reloading Manual"

Steindler, Firearms Dictionary

Periodicals

"Fundamentals -- Internal Ballistics," American Rifleman, Feb. 1963, pp. 32-35.
"Gunpowder Development," American Rifleman, Oct. 1959, pp. 38-40.

Hatcher, J.S., "This Stuff Gunpowder," American Rifleman, Aug. 1949, pp. 32-34 and Sep. 1949, pp. 35-36.

"Modern Gunpowders," American Rifleman, Oct. 1949, pp.26-30.

Weller, J., "Quality in U.S. Ammunition, " American Rifleman, Oct. 1975, pp.48-51.

AFTE Journal

Bydal, B.A., "Percussion Primer Mixes," 1990; 22(1): 1-26.

Dillon, J.H., "The Manufacture of Conventional Smokeless Powder," 1991; 23(2): 682-688.

Johnson, T.D., and Matty, W., "Eclipse All Plastic Shotshells," 1983; 15(4):60.

Matty, W.P., "Primer Composition and Gunshot Residue," 1987; 19(1): 8-13.

Videotapes

Every Single Round, Federal Cartridge Company, Anoka, MN, 1993.

Metallic Cartridge Reloading, Lenny Magill Productions, San Diego, CA.

F. INSTRUMENTATION

1. Differentiate between the following:

   a. compound microscope
   b. stereo microscope
   c. comparison microscope

   (*Use Training Assignment #30 and Practical Exercise #7 to complete this objective*.)

   _____ _____
   Training Officer Date

2. Study the instruction manual for the various brands of stereo microscopes. Determine how to insert a reticle and how to check the calibration of the microscope.

   (*Use Practical Exercise #7 to complete this objective*.)

   _____ _____
   Training Officer Date

3. Familiarize yourself with the instruction manuals and the mechanical and optical aspects of the various brands of comparison microscopes in the Firearm Section. Note the differences and similarities in each, both mechanically and optically.

   (*Use Training Assignment #30 and Practical Exercise #7 to complete this objective*.)

   _____ _____
   Training Officer Date

4. Familiarize yourself with the following types of light sources, which are in use in the Firearm Section on the comparison microscopes.

   a. Fluorescent
   b. Fiber optics (*with and without filters*)

   (***Use Training Assignment #30 and Practical Exercise #7 to complete this objective*.)**

   _____ _____
   Training Officer Date

5. Using each type of light source in the field of view on a comparison microscope, note the differences in the quality of each using the following different surfaces: lead bullets, jacketed bullets, various types of cartridge cases, and various types of surfaces containing impressed and striated toolmarks. Manipulate the above light sources with respect to angle and vary the intensity of the light source, if possible. Gain an appreciation for the effects of varying the angle and intensity for each light source on each type of surface. Discuss this with your Training Officer.

(*Use Training Assignments #30 and #31 and Practical Exercises #7 and #8 to complete this objective*.)

_____ _____
Training Officer Date

6. Set up a comparison microscope for your vision requirements and focus the "*hairline*." Prepare the microscope for your personal use, and familiarize yourself with each set of objective lenses on your comparison microscope. Become familiar with the different types of Polaroid film and/or other photographic systems used in the Firearm Section with the comparison microscopes. Master the use of the Polaroid Land film holder. Using all of the objective lenses, make timed exposures of the same objects while varying the intensity and angle of the light sources. Calculate the magnification for each set of objective lenses on your comparison microscope.

(*Use Training Assignment #30 and Practical Exercise #7 to complete this objective*.)

_____ _____
Training Officer Date

7. Become familiar with and demonstrate the use of the following equipment:

   a. speed micrometer
   b. inertia bullet puller
   c. steel rule
   d. reticle in ocular lens of binocular microscope
   e. Ainsworth scale
   f. balances and scales located in the Firearm Section
   g. Stage micrometer
   h. Digital (electronic) micrometer
   i. depth gauge (Federal brand or equivalent for firing pin impression measurements

(*Use Training Assignment #31 and Practical Exercise #8 to complete this objective*.)

_____ _____
Training Officer Date

REFERENCE MATERIALS
MICROSCOPY AND INSTRUMENTATION

The following reference materials serve several purposes:

- to provide a wider range of additional resources should you have a particular interest in a given topic.
- to provide reference materials for your future professional use.
- to allow you to gain additional depth in particular subject areas.

Should you encounter other references in this category, you are encouraged to make additional notes about them at the end of this listing.

AFTE Journal

Biasotti, A.A., "Photomicrography and Illumination: Some Critical Factors," 1979; 11(4):60.

Chamberlain, D., "Microscope Comparison Bridge," 1972; 4(1):9.

Cook, C.W., "Basic Optics," 1985; 17(4):14.

Haemmerle, C., "Easily Made Diffusers for Fiber Optic Illuminators," 1990; 22(4): 446-447.

Hueske, E.E., "Application of Fiber Optic Videomicroscopy to Firearm and Toolmark Examination: A Further Look," 1993; 25(2):132-139.

---. "Preliminary Report on the Application of Fiber Optic Videomicroscopy to Firearm and Toolmark Examination," 1990; 22(3):280-287.

Lansing, J.F., "Customized Comparison Microscope," 1973; 5(5):25.

Lutz, M.C., "Evaluation of New Fiber Optics System," 1986; 18(1):12.

Moran, B., "Building an Inexpensive High Intensity Fluorescent Lighting System for the Comparison Microscope," 1997; 29(1):49-54.

Ziegler, P.A., "Examination Techniques: The Beam Splitter and Reverse Lighting," 1983; 15(2):37.

Periodicals

Schlueter and Gumperty, "The Stereomicroscope - Instrumentation and Techniques," American Laboratory, Apr. 1975.

Manuals

Leica Microsystems, Inc., “Operating Instructions for the K2700 Universal Forensic Microscope (UFM IV).”

---. “The Leica Universal Forensic Microscope”

---. “Reference Manual, Photostar Automatic Camera System”

---. “The Leica DMC Comparison Microscope”

Basic References

American Optical, "Procedure for Bullet Comparison"

Bartels, P., "Microscope Optics”

Needham, G.H., "The Microscope A Practical Guide”

G. EXAMINATION OF FIREARMS

1. Define each of the following types of firearms and explain in detail the operation of each type to include the loading of cartridges and the subsequent movement of the cartridge case and/or bullet after firing.

    a. revolver, single and double action
    b. autoloading pistol, single and double action
    c. derringer and single shot pistols
    d. bolt-action rifle
    e. autoloading rifle
    f. pump-action rifle
    g. various single shot rifles
    h. submachine gun
    I. assault rifle
    j. Muzzle loading firearm
    k. Percussion revolvers

    (*Use Training Assignment #11 to complete this objective*.)

    _____ _____
    Training Officer Date

2. Explain and illustrate the differences between a gas-operated and a recoil-operated autoloading shotgun.

    (*Use Training Assignment #12 to complete this objective*.)

    _____ _____
    Training Officer Date

3. Explain and illustrate the differences between the following types of autoloading pistols:

    a. blowback action
    b. delayed blowback action
    c. gas-delayed blowback action
    d. short recoil action
    e. long recoil action

    (*Use Training Assignment #12 to complete this objective*.)

    _____ _____
    Training Officer Date

4. Partially disassemble and reassemble the following revolvers. Photograph and note the differences in their mechanisms. Identify each part by name.

   a. Smith & Wesson double-action revolver
   b. Colt double-action revolver
   c. Ruger double-action revolver
   d. "*Old style*" Ruger single-action revolver
   e. "*New style*" Ruger single-action revolver

   (*Use Training Assignment #15 to complete this objective*.)

   _____ _____
   Training Officer Date

5. Field strip and reassemble the following pistols. Note and photograph differences in their mechanisms. Identify each part by name.

   a. 9mm Luger Browning, Hi-power, pistol
   b. .45 Auto caliber U.S. Pistol, Model 1911A1, pistol
   c. 9mm Luger Steyr, GB, pistol
   d. 9mm Luger Glock, Model 17, pistol
   e. 9mm Luger Beretta, Model 92F, pistol
   f. 9mm Luger SIG-Sauer, Model 226, pistol
   g. 9mm Luger Smith & Wesson, Model 669, pistol
   h. 9mm Luger H&K, P7, pistol
   I. 357 Magnum Desert Eagle pistol
   j. 9mm Luger Walther P38 pistol
   k. 380 Automatic Walther PPK pistol
   l. 8mm Arisaka Type 14 pistol
   m. 9mm Luger P08 pistol

   (*Use Training Assignments #16, #17, and #18 to complete this objective*.)

   _____ _____
   Training Officer Date

6. Field strip and reassemble the following submachine guns. Note differences in the mechanism and operation of each. Make appropriate photographs for your notes and identify the major parts by name.

   a. .45 Auto caliber RPB Industries, M10, submachine gun (open bolt and closed bolt)
   b. 9mm Luger SWD Inc., M11/Nine, submachine gun
   c. 9mm Uzi submachine gun
   d. 9mm H&K, MP5, submachine gun
   e. .45 Auto caliber US M3 submachine gun
   f. 9mm Intratec, TEC 9, submachine gun
   g. .45 Auto caliber Thompson submachine gun

   (*Use Training Assignment #19 to complete this objective*.)

   _____ _____
   Training Officer Date

7. Familiarize yourself with the operation of each of the following firearms. Identify the major parts by name and make appropriate notes.

   a. .30-06 Springfield caliber U.S. Rifle, Model M1
   b. .308 Winchester caliber U.S. Rifle, Model M14
   c. .223 Remington caliber U.S. Rifle, Model M16
   d. .300 Savage caliber, Savage, Model 99, rifle
   e. .30-30 Winchester caliber Winchester Model 94 rifle
   f. 7.62x39mm caliber AK47/74 and SKS rifle
   g. .30-40 Krag caliber U.S. Rifle 1898
   h. .303 British caliber Lee Enfield rifle
   I. .30-06 Springfield caliber U.S. Rifle, Model 1903

   (*Use Training Assignments #21 and #22 to complete this objective*.)

   _____ _____
   Training Officer Date

8. Familiarize yourself with the operation of each of the following shotguns. Identify the major parts by name and make appropriate notes.

   a. Remington, Model 870, shotgun
   b. Winchester, Model 12, shotgun
   c. Ithaca, Model 37, shotgun
   d. Browning, Model A5, shotgun
   e. Remington, Model 1100, shotgun
   f. Harrington & Richardson, Topper Model 158, shotgun
   g. L.C. Smith, side-by-side, double-barrel, shotgun
   h. Savage, Model 311, side-by-side, double-barrel, shotgun
   i. Beretta, Silver Snipe, over-under, double-barrel, shotgun

   (Use Training Assignment #23 and #24 to complete this objective.)

   _____ _____
   Training Officer Date

9. Familiarize yourself with the operation of each of the following firearms. Identify the major parts by name and make appropriate notes.

   a. .22 caliber Browning autoloading rifle
   b. .22 caliber Winchester, Model 62, rifle
   c. .22 caliber Remington, Model 582, rifle
   d. .22 caliber Ruger, Model 10/22, rifle
   e. .22 caliber Ruger, MKII, pistol
   f. .22 caliber Colt, Woodsman, pistol
   g. .22 caliber Raven, Lorcin, Jennings

   (*Use Training Assignment #25 to complete this objective*.)

   _____ _____
   Training Officer Date

10. Familiarize yourself with the operation of each of the following firearms. Identify the major parts by name and make appropriate notes.

    a. .25 Auto caliber Raven Arms pistol
    b. .25 Auto caliber Colt Jr. pistol
    c. .25 Auto caliber Beretta pistol
    d. .25 Auto caliber Bauer pistol

    (*Use Training Assignment #20 to complete this objective*.)

    _____ _____
    Training Officer Date

11. Familiarize yourself with the Firearm Section Range Rules and Safety Rules regarding firearms. Demonstrate, using firearms from No. 4 through No. 9 above and others, how to place firearms in a safe condition, how to load and unload each, how to handle and carry these firearms in the Laboratory, and how to safely test fire each of these different types of firearms.

    (*Use Training Assignments #15 through #25 to complete this objective*.)

    _____ _____
    Training Officer Date

12. Using the firearms in No. 4 through No. 9 above, study the various safety mechanisms employed in each design. Include thumb safety, grip safety, magazine safety, firing pin block, transfer bar, and any other mechanical safety. Illustrate how the firing mechanisms are blocked, interrupted, or otherwise stopped from operating.

    (***Use Training Assignments #15 through #29 and Practical Exercises #3 through #6 to complete thi***

    _____ _____
    Training Officer Date

13. Familiarize yourself with the Firearm Section equipment used for measurement of trigger pull. Determine the trigger pull on at least one firearm from each of the firearms listed in the No. 4 through No. 9 groups, using various methods and compare the results.

    (*Use Training Assignments #15 through #29 and Practical Exercises #3 through #6 to complete thi*

    _____ _____
    Training Officer Date

14. Discuss with your Training Officer the protocol to be used in determining whether a firearm "*can be made to fire without pulling the trigger*." Demonstrate, using one firearm from each of the No. 4 through No. 9 groups of firearms above, how to conduct this type of examination.

    (*Use Training Assignments #15 through #29 and Practical Exercises #3 through #6 to complete thi*

    _____ _____
    Training Officer Date

15. Research, define, and/or determine the implications of the following terms as they relate to safety in the operation of a firearm.

a.	excessive headspace	j.	defective safety
b.	bore obstruction	k.	high primer
c.	barrel bulge	l.	rail splitting
d.	broken extractor	m.	hairline cracks
e.	push off	n.	improper timing
f.	trigger shoe	o.	excessive pressure
g.	false half-cock	p.	dented barrel
h.	slam-fire	q.	jar-off
i.	inadequate/improper sear engagement		

(*Use Training Assignment #28 and Practical Exercise #5 to complete this objective*.)

_____ _____
Training Officer Date

16. Become familiar with the Section firearm range including its physical dimensions, construction of walls and backstop, and bullet velocity limitations. Know how to test fire firearms thought to be possibly unsafe. Become familiar with the use of all the equipment on the range. Know the range rules and emergency medical treatment procedures.

(*Use Training Assignment #28 and Practical Exercise #5 to complete this objective*.)

_____ _____
Training Officer Date

17. Attend armorer training offered by various manufacturers of firearms, at their manufacturing facilities, if possible. Coordinate these with your Training Officer.

_____ _____
Training Officer Date

18. Explore the capabilities in restoring an inoperable evidence firearm to operating condition and also know the limitations and reservations, which must be considered. Discuss these with your Training Officer.

_____ _____
Training Officer Date

19. Review and record the references in the Firearm Section library, which can be used to identify the manufacturer and/or source of a firearm using the following criteria:

    a. proof marks
    b. inspector marks
    c. factory numbers and markings
    d. serial number
    e. part numbers
    f. company logos

    (*Use Training Assignment #29 and Practical Exercise #6 to complete this objective*.)

    _____ _____
    Training Officer Date

20. Discuss the following topics with your Training Officer and become familiar with the capabilities and limitations of the section in regard to these areas:

    a. Marking evidence firearms, recognition, documentation, recovery, and retention of trace evidence from the bore of a firearm prior to test firing.
    b. Determining whether an evidence firearm has been "*recently*" fired
    c. Determining the manufacturer of a firearm from an examination of a part from a firearm.
    d. Determining the manufacturer of a firearm from a photograph and comparing an evidence firearm to a photograph

    (*Use Training Assignment #29 and Practical Exercise #6 to complete this objective*.)

    _____ _____
    Training Officer Date

21. Become knowledgeable about how to submit evidence firearms to the Laboratory when they have been recovered from water or when they are in a rusted condition. Also, become familiar with the capabilities, limitations, and reservations, which must be considered when restoring such firearms to operating condition to obtain test specimens from them.

    _____ _____
    Training Officer Date

22. Discuss with your Training Officer how to conduct an examination to determine if a firearm has been altered to fire full automatic. Using a firearm, which has been altered to fire full automatic, conduct this type of examination and verbally report your findings.

    _____ _____
    Training Officer Date

REFERENCE MATERIALS
GENERAL PRELIMINARY EXAMINATIONS OF FIREARMS

The following reference materials serve several purposes:

- to provide a wider range of additional resources should you have a particular interest in a given topic.
- to provide reference materials for your future professional use.
- to allow you to gain additional depth in particular subject areas.

Should you encounter other references in this category, you are encouraged to make additional notes about them at the end of this listing.

General

Burrard, G., Identification of Firearms and Forensic Ballistics, 1st edition, Charles Scribner Sons, NY, 1934, revised edition, A.S. Barnes & Co., NY, 1964.

Davis, J.E., An Introduction to Tool Marks, Firearms and the Striagraph, Charles C. Thomas, Springfield, IL, 1958.

Gunther, J.D., and Gunther, C.O., The Identification of Firearms, John Wiley and Sons, Inc., New York, 1935.

Hatcher, J.S., Hatcher's Notebook, Military Service Publishing Company, Harrisburg, PA, 1947.

Hatcher, J.S., Jury, F.J. and Weller, J., Firearms Investigation, Identification and Evidence, 2nd edition, Stackpole Books, Harrisburg, PA, 1957.

Heard, B.E., Handbook of Firearms and Ballistics: Examining and Interpreting Forensic Evidence, John Wiley & Sons, New York, 1997.

Mathews, J.H., Firearms Identification, Volumes I □ III, Charles C. Thomas, Springfield, IL, 1962.

NRA Firearms Fact Book, 3rd edition, National Rifle Association, Fairfax, VA, 1989.

AFTE Journal

Case Notes

"California Department of Justice Firearms Toolmark Identification Training Syllabus: Professionalism," 1991; 23(1):559-578.

Examination Protocols and Procedure

"California Department of Justice Firearms Toolmark Identification Training Syllabus: Professionalism," 1991; 23(2):703-715.

Worksheets

"California Department of Justice Firearms Toolmark Identification Training Syllabus: Professionalism," 1991; 23(2):712.

Cooper, R.E., "Firearm Safety and Trigger Pull Worksheet," 1995; 27(3):vii.

Hildebrandt, C., "Problems with Preservation of Evidence for Secondary Gun Examination," 1991; 23(4):982-985.

Howe, W.J., "Laboratory Work Sheets," Newsletter #2, Aug. 1969, pp. 13-14.

Jordan, T.D., "Oklahoma State Bureau of Investigation Firearms Laboratory: A Pictorial Display," 1979; 11(4):46.

Thompson, R.C., "Firearms Malfunction Worksheets," 1983; 15(1):100.

Untitled insert, Newsletter #3, Oct. 1969, pp. 17, 18, 21.

Untitled insert, Newsletter #4, Dec. 1969, pp. 25, 27.

Reporting of Conclusions

"California Department of Justice Firearms Toolmark Identification Training Syllabus: Professionalism," 1991; 23(2):719-726.

Accidental Discharge Potential

Berg, S.O., "Air Gun Safety Designs," 1992; 24(2):165-171.

---. "Author's Response," 1991; 23(3):781-783.

---. "False Safety Notch: Firearms Design Problem," 1989; 21(4):580-582.

---. "Firearms Safety Design Origins and the Firearms," 1996; 28(4):211-221.

---. "Gas Handling, Containment, Deflection and Venting for Bolt Action Rifles," 1992; 24(4):375-380.

---. "History of Revolver Safeties," 1982; 14(4):29.

---. "History of Revolver Safeties," 1989; 21(2):309-313.

---. "History of the Derringer Pistol," 1985; 17(3):91.

---. "Jar Off: A Critical Firearms Design Factor," 1990; 22(4):390-394.

---. "Lever Action Firearms Safeties," 1988; 20(1):64-71.

---. "Magazine Safeties: Important Safety Design," 1993; 25(4):301-307.

---. "Rohm RG Industries Firearms and Safeties," 1986; 18(2):72.

---. "Safety Design: Remington Semiautomatic Shotguns," 1989; 21(3):496-499.

---. "Safety Loading/Unloading Designs of Revolvers," 1991; 23(4):931-939.

---. “Safety Notch: Design Dangers Through the Ages,” 1994; 26(1):4-10.

Binsbacher, H., “Caution: When Examining Remington Arms Co. Model of 1911,” 1973; 5(3):21.

Brundage, D.J., “Bauer Accidental Discharge,” 1982; 14(1):62.

Buckleton, J.S., and Walsh, K.A.J., “Perplexing Accidental Discharge of Ammunition,” 1992; 24(1):46-54.

Chenow, R.W., “False Half Cock Position in Semiautomatic Handguns,” 1977; 9(2):179.

Conrad, W.E., “Browning Hi Power Without Magazine Safety,” 1978; 10(2):87.

Denio, D.J., “Uzi Semiautomatic Carbine: A Potential Hazard,” 1984; 16(3):19.

Doyle, J.S., “Possible Malfunction of a Savage 30-30 Rifle,” 1983; 15(4):5.

Dujanovich, M.B., “Accidental Firearms Discharge,” 1985; 17(2):56.

Fineman, L.T., “Taurus Recall,” 1978; 10(2):33.

Fournier, R.J., “COP Pistol: Additional Information,” 1983; 15(4):18.

---. “Dangerous Doubling,” 1982; 14(1):44.

Gamboe, T.E., “Arminius HW3 Hammerblock Failure,” 1993; 25(4):286-291.

Garrison, T., “Altered Firing Pin Contributes to Accidental Discharge,” 1991; 23(4):908-909.

Gieszl, R., and Wolslagel, P.F., “Accidental Death by a Pen Gun,” 1990; 22(4):448-450.

Hildebrandt, C., “Editorial,” 1991; 23(3):780-781.

Komar, S.M., “Accidental Firing of an RG Pistol,” 1973; 5(1):25.

Kreiser, M.J., “Thompson Center Lock Mechanisms,” 1983; 15(2):15.

Krivosta, G.G., “One in a Million Firearms Accident,” 1993; 25(3):206-208.

Lipscomb, J.W., and Harden, L.R., “Evaluating Trigger Mechanisms for Sensitivity to Shock,” 1985; 17(4):4.

Maruoka, R.K., “Unsafe Condition,” 1995; 27(3):233-236.

Masur, H.Q., “$2,000,000 Defense,” 1983; 15(1):69.

Molnar, S., “Use of Scale Drawings to Establish Facts in Shooting Cases,” 1970; 2(2):2-14.

Pex, J.O., “Accidental Discharge of a Smith and Wesson Model 659,” 1994; 26(1):18-20.

Phillips, G.R., “Ruger Security-Six Revolver for Accidental Discharge,” 1983; 15(4):56.

“Product Recalls Warnings,” 1992; 24(1):80.

Reitz, J.A., “Trigger Shoes Causing Accidental Shootings,” 1976; 8(4):64.

Robinson, E.L., “Accidental Discharge of a Cobray Selective Fire Pistol,” 1990; 22(1):43-46.

“Remington Arms Recall,” 1979; 11(1):19.

“Safety Notice: Galil Rifle System,” 1985; 17(4):3.

“Safety Notice: Galil Rifles,” 1985; 17(3):62.

Silverwater, H., Shoshani, E., Argaman, U., Hocherman, G., and Schecter, B., “Accidental Discharge of a FN Browning Hi-Power Pistol,” 1996; 28(4):233-240.

Swearengen, T.F., “Firearms Accident Investigation Involving Ithaca Model 37 Police Shotgun,” 1975; 7(1):37.

Thompson, E., “Nick in Time,” 1996; 28(1):45-47.

Thompson, R.W., and Amble, A.M., “Ruger Mark 1 Pistol Accidental Discharges,” 1980; 12(2):16.

Vaughan, R.T., “Accidental Eruption of a Cartridge,” 1980: 12(3):48.

Vaughan, R.T., and Kreiser, M.J., “Potential Accidental Discharge in a Semiautomatic Firearm,” 1990; 22(1):47-48.

Vitale, V., “Potential Safety Hazard Interdynamic KG 99,” 1984; 16(3):24.

---. “Potential Safety Hazard Interdynamic KG 99,” 1985; 17(2):88.

Warren, G., “Temperature Initiated Discharge,” 1991; 23(3):849.

Alterations and Modifications

Barabash, T., “Unique Springfield Rifle,” 1976; 8(4):41.

Biasotti, A.A., “Semiautomatic Rifle That is a Full Automatic,” 1971; 3(6):22.

Branch, D.M., “Modification of 16 Gauge Shotgun To Fire 12 Gauge Shotshells,” 1983; 15(3):14.

Brundage, D.J., “Homemade Automatic,” 1978; 10(2):52.

Chenow, R.W., “Conversion of the Intratec Tec 9 to Full Auto,” 1987; 19(2):169-171.

Cunningham, J., “Hit Gun,” 1975; 7(1):40.

---. “Full Auto Conversion of the Intratec Tec 9: An Update,” 1988; 20(2):165-166.

---. “Illinois State Police Model 39 Barrel Ramp Modifications,” 1983; 15(4):6.

---. “Mauser Rifle To Shotgun Conversion,” 1986; 18(1):16.

Chenow, R.W., and Lemmer, J.T., “Correction: PPS/50 Full Auto Modification Attempt Resulting in a Dangerous Firearm,” 1990; 22(3):345.

---. “PPS/50 Full Auto Modification Attempt Resulting in a Dangerous Firearm,” 1990; 22(2):174-185.

Finor, J.M., “Uncontrollable Full Automatic Fire Occurring in a Walther Pistol, Model PP,” 1996; 28(1):48-54.

Freeman, R.A., “M11/Nine and KG 99 Closed Bolt Semiautomatic Pistols,” 1985; 17(2):92.

Galan, J.I., “Conversion of the KG-9 Pistol,” 1983; 15(1):60.

Garland, P.V., “Another Modification of the RPB,” 1985; 17(2):71.

Grey, D.T., “Alteration of an RPB Industries Model 10 Pistol,” 1983; 15(4):26.

Hofmeister, A.G., “Conversion of .36 Navy To Fire .38 Smith & Wesson,” 1978; 10(2):65.

---. “Conversion of an Obsolete Revolver,” 1983; 15(2):14.

Johnson, T.D., “Machine Gun Auto Sear,” 1988; 20(3):322-324.

Kennington, R.H., “Ruger Blackhawk Automatic Revolver Conversion,” 1978; 10(1):34.

Laskowski, G.E., “Full Auto Conversion of an UZI 9mm Semiautomatic Pistol,” 1995; 27(4):287-292.

Love, E.W., “Full Automatic AR-15 Rifle,” 1978; 10(2):46.

Lutz, M.C., “Atchisson Device for Conversion Unit for AR-15 & M-16 Rifles,” 1973; 5(5):18.

Matthews, J.W., “Improvised Shotshell Firearm,” 1981; 13(1):13.

Mogish, N.M., “Full Auto Uzi Conversion,” 1990; 22(2):186-187.

Molnar, S., and Nicholson, T., “Homemade Machine Gun,” 1970; 2(4):28.

Rathman, G.A., “Two or More Alterations of the RPB Semiautomatic Pistol,” 1984; 16(3):13.

Rathman, G.A., and Rudolph, N.J., “Full Auto Conversion of an AK-47 and HK94,” 1990; 22(3):302-306.

Schubert, K.H., “Full Auto Conversion Of An RPB Industries M10,” 1989; 21(3):511-512.

Stengel, R.F., “Illegitimate Smith & Wesson Model 59 Autos?,” 1977; 9(2):167.

Templin, R.H., “Full Auto Conversion of F.N. Belgium, FNC,” 1989; 21(3):509-510.

Thompson, E., “Conversion of a 45 Caliber Semiautomatic Pistol to 9mm Parabellum,” 1989; 21(4):650.

---. “Converted Colt Semiautomatic Pistol Revisited,” 1990; 22(3):337-338.

---. “Modified Semiautomatic Pistol,” 1988; 20(2):195.

---. “Two Shot Double Barrel Shotgun Suicide,” 1991; 23(4):973-976.

Thornton, J.I., and Rios, F.G., “Full Automatic Fire Conversions of the Colt AR 15 and Variants,” 1983; 15(1):114.

Trahin, J.L., “Disguised Conversion of the RPB (MAC 10) Pistol,” 1988; 20(4):452-453.
Yales, L., “Modified Rohm Revolver,” 1980; 12(1):41.

Zahn, M.S., “Browning Hi Power Automatic Pistol: Another Type of Full Automatic Modification,” 1981; 13(2):24.

---. “Browning Hi Power Automatic Pistols Full Automatic Modification,” 1978; 10(1):13.

---. “RPB Industries M10 Autoloading Pistol Full Automatic Modification,” 1980; 12(3):29.

---. “RPB Industries M10 Autoloading Pistol: New Rifling Observed,” 1981; 13(2):32.

Ward, J.G., “Information,” 1971; 3(2):26.

Barrel Obstructions

Berg, S.O., “Rifle Barrel Obstruction Tests and Experiments,” 1991; 23(4):951-957.

Barrel Ruptures

“Smith & Wesson Information, “ 1979; 11(1):22.

Edwards, R.L., “Circumferential Fractures,” 1991; 23(3):806-807.

Voorhees, R.S., “Very Lucky Man,” 1976; 8(4):68.

Cartridge Case Ruptures

Andrews, D., “Warning Do Not Use Blazer 357 Magnum Ammunition in Rifles,” 1983; 15(3):12.

Dujanovich, M.B., “Accidental Firearms Discharge,” 1985; 17(2):56.

Edwards, R.L., “Circumferential Fractures,” 1991; 23(3):806-807.

Garland, P.V., “SATA Semiautomatic Pistol,” 1970; 2(7):23.

Haag, L.C., “Novel Means of Propellant Identification in Shooting Mishap,” 1983; 15(4):42.

McBeth, R.G., “Another Potentially Dangerous Weapon from a Starters Gun,” 1975; 7(1):72.

McBrayer, W.S., “Unrifled Adapter: The PC-410 Shot Shell Adapter,” 1985; 17(2):69.

Robinson, M.K., “Raven Pistol Firing Out of Battery,” 1988; 20(2):207-208.

Vaughan, R.T., “Accidental Eruption of a Cartridge,” 1980; 12(3):48.

Vitale, V., “Potential Safety Hazard Interdynamic KG 99,” 1984; 16(3):24.

Drop Testing

Gunnell, D.L., “Mechanical Malfunction of Safety Device,” 1978; 10(2):30.

Lipscomb, J.W., and Harden, L.R., “Evaluating Trigger Mechanisms for Sensitivity to Shock,” 1989; 21(2):382-384.

Noedel, M., Franklin, T., Krylo, J., and Kusumi, R., “Drop Testing a .45 Auto Colt 1911,” 1997; 29(2):183-185.

Firearm Markings

Ball, P., and Mikko, D., “Proof Marks,” 1992; 24(1):14-15.

Bates, J.S., “Ithaca Serial Numbers,” 1970; 2(1):16.

Dragan, P., “Notes on Serial Numbers on the AK-47 Type, Assault Rifle,” 1996; 28(1):22-24.

Fraser, D.A., “Firearms Grip Logos & Trademarks,” 1986; 18(1):52.

Goddard, C.H., “Proof Tests and Proof Marks,” 1983; 15(2):116.

Gun Week, “Marlin Computerizes System for Recording Serial Numbers,” 1972; 4(4):20.

Guns & Ammo,” United States Military Serial Numbers for 1911, 1911A1 .45 Automatics,” 1971; 3(3):7.

Hawkins, R.R., “Colt Revolvers with Identical Serial Numbers,” 1988; 20(2):190-191.

Howe, W.J., “Location of Serial Numbers on Ruger Weapons,” 1972; 4(3):28.

Keisler, M.A., “Smith and Wesson Model SW9F and the Hidden Serial Number,” 1997; 29(2):186-187.

Kreiser, M.J., “Information on Browning Serial Numbers,” 1985; 17(2):22.

Nielson, B.C., “Location of Serial Numbers on Colt Weapons,” 1972; 4(2):40.

Improvised/Homemade Firearms

Butler, D.J., “5/8" x 4" Stove Bolt Zip,” 1974; 6(2):5.

Cooper, R.E., “Disguised 22 Caliber Weapon,” 1988; 20(2):192.

Fournier, R.J., “Rocket Gun: Homemade,” 1982; 14(1):26.

Garland, P.V., “Improvised Firearm: Tire Pressure Gauge,” 1989; 21(1):79.

---. “Mondial Model 999 Blank/Starter Revolver,” 1985; 17(2):52.

FBI, “Cigarette Lighter Pistol,” 1979; 11(4):57.

---. “Deadly Contraption,” 1981; 13(4):53.

---. “Double Barreled Threat,” 1981; 13(4):117.

---. “Homemade BB Gun,” 1972; 4(4):34.

---. “Homemade Pipe Shotgun,” 1981; 13(3):16.

---. “Pipe Pistol,” 1980; 12(3):75.

George, W., “Disguised 12 Gauge Shotgun,” 1988; 20(2):193.
Hamby, J.E., “Shotgun Boobytrap,” 1980; 12(1):35.

Harden, L.R., “Factual or Fake,” 1976; 8(1):59.

---. “Zip Gun,” 1975; 7(2):107.

Harriman, J.J., and Wilder, R., “Tear Gas Pen Guns: Who Will the Victim Be?” 1974; 6(4):4.

Heffernan, T.F., “What Next,” 1977; 9(2):203.

Heflin, T.F., “Two Homemade Weapons,” 1988; 20(2):204.

Hensley, O.L., “Homemade Weapons from Thailand,” 1972; 4(4):35.

Higgs, T., “Staplegun Firearm Case,” 1994; 26(1):34-36.

Lattyak, E.K., “Crude Pen Gun,” 1987; 19(3):322-323.

Lee, F.R., “Unusual Homemade Firearm,” 1979; 11(3):64.

Lewis, D.C., “Where There’s a Will There’s a Way,” 1981; 13(4):29.

Lutz, M.C., “Homemade Shotgun Used in Suicide,” 1994; 26(2):161-165.

Mason, J.J., “Conversion of Butler Associates Replica Derringer to Firing Condition,” 1989; 21(1):37.

McBeth, R.G., “Another Potentially Dangerous Weapon from a Starters Gun,” 1975; 7(1):72.

Molnar, S., “Booby Trap: Cover Story,” 1971; 3(4):6.

---. “Trap Gun: An Interesting Illegal Hunting Device,” 1980; 12(2):19.

Monument, R., “Altered Blank Revolver Identification,” 1972; 4(2):22.

Perkins, W.E., “Hazards of Firing Homemade Weapons,” 1976; 8(1):55.

Rodney, J.C., “Forged Firearms of the Pathan,” 1988; 20(1):85-94.

Simpson, R.L., “Modified Starter Revolver,” 1987; 19(3):303.

Smith, L.L., “Zip Guns,” 1970; 2(5):29.

Smith, R.M., “Potentially Dangerous Weapons from a Starters Gun,” 1973; 5(5):34.

Templin, R.H., “Manufacture of a M10 SMG Receiver,” 1985; 17(2):110.

Uchiyama, T., and Ishihara, M., “Forged 45 Colt Semiautomatic Pistols,” 1988; 20(1):81-84.

Woodward, R.J., “Look for the Conventional and the Bizarre,” 1978; 10(2):43.

Vagnozzi, V., “Modified Bruny Alarm Pistol,” 1989; 21(1):89.

---. “Modified S M 12 Gas Pistol,” 1989; 21(1):84.

Photography

Burton, W.E., “Actually, Axial Lighting Works,” 1991; 23(4):963-965.

Cassidy, F.H., “Method To Deal With Polaroid Film Back Problems,” 1983; 15(4):26.

Haag, L.C., “Information on Construction of High Speed Photography Unit,” 1985; 17(2):74.

Haag, L.C., and Kokanovich, J., “Shot in the Dark: A Procedure for the Photographic Documentation of Firearm’s Muzzle Flash,” 1991; 23(4):910-918.

Lutz, M.C., and Buck, J.C., “High Speed Photography Applied to Firearms Identification,” 1984; 16(4):75.

Parian, R.W., “Sound Trigger for Stop Action Photography,” 1975; 7(2):92.

Wilhelm, R.M., “Use of High Speed Photography in Firearms Cases,” 1972; 4(2):4.

Trace Evidence Concerns

Dixon, T.R., “Trace Evidence in a Toolmarks Case,” 1975; 7(1):70-71.

Murdock, J.E., “Associative Evidence,” 1984; 16(2):5.

Versailles, J., “Metal Residue Build-Up on Tool Blades,” 1974; 6(4):7.

Trigger Pull Analyses

Cooper, R.E., “Firearm Safety and Trigger Pull Worksheet,” 1995; 27(3):vii.

Dillon, J.H., “The Trigger Scan System Microprocessor Technology Applied to Precision Trigger Pull Analyses,” 1999; 31(2):123-130.

Gamboe, T.E., “MAFS Firearms Workshop: Trigger Pull Methods,” 1986; 18(3):77.

Hamby, J.E., “Trigger Pull Data for Selected Military Weapons,” 1972; 4(1):23.

Krylo, J., and Slonina, S., “Trigger Pull Statistics,” 1985; 17(1):79.

Lomoro, V.J., “Statistical Analysis of Trigger Pulls,” 1986; 18(1):35.

Quirk, T.W., “Handgun Trigger Pull Scale/Dry Fire Safety Station,” 1994; 26(2):119-120.

Rios, F.G., and Thornton, J., “Static vs Dynamic Determination of Trigger Pull,” 1984; 16(3):84.

Rosenberg, S.F., “Some Colt Firearm Trigger Pulls from the Factory,” 1973; 5(5):5.

Templin, R.H., and Nielson, J.P., “Evaluation of the Effects of Cyanoacrylate Processing on Pistol and Revolver Trigger Pull,” 1988; 20(4):443-445.

Thompson, E., “Preloaded vs Normal Trigger Pull Weights,” 1995; 27(1):62-64.

REFERENCE MATERIALS
TEST FIRING FOR KNOWN SPECIMENS AND OPERABILITY

General

Burrard, G., Identification of Firearms and Forensic Ballistics, 1st edition, Charles Scribner Sons, NY, 1934, revised edition, A.S. Barnes & Co., NY, 1964.

Davis, J.E., An Introduction to Tool Marks, Firearms and the Striagraph, Charles C. Thomas, Springfield, IL, 1958.

Gunther, J.D., and Gunther, C.O., The Identification of Firearms, John Wiley and Sons, Inc., New York, 1935.

Hatcher, J.S., Hatcher's Notebook, Military Service Publishing Company, Harrisburg, PA, 1947.

Hatcher, J.S., Jury, F.J. and Weller, J., Firearms Investigation, Identification and Evidence, 2nd edition, Stackpole Books, Harrisburg, PA, 1957.

Heard, B.E., Handbook of Firearms and Ballistics: Examining and Interpreting Forensic Evidence, John Wiley & Sons, New York, 1997.

Mathews, J.H., Firearms Identification, Volumes I III, Charles C. Thomas, Springfield, IL, 1962.

NRA Firearms Fact Book, 3rd edition, National Rifle Association, Fairfax, VA, 1989.

AFTE Journal

Case Notes

"California Department of Justice Firearms Toolmark Identification Training Syllabus: Professionalism," 1991; 23(1):559-578.

Examination Protocols and Procedures

"California Department of Justice Firearms Toolmark Identification Training Syllabus: Professionalism," 1991; 23(2):703-715.

Worksheets

"California Department of Justice Firearms Toolmark Identification Training Syllabus: Professionalism," 1991; 23(2):712.

Cooper, R.E., "Firearm Safety and Trigger Pull Worksheet," 1995; 27(3):vii.

Hildebrandt, C., "Problems with Preservation of Evidence for Secondary Gun Examination," 1991; 23(4):982-985.

Howe, W.J., "Laboratory Work Sheets," Newsletter #2, Aug. 1969, pp. 13-14.

Jordan, T.D., “Oklahoma State Bureau of Investigation Firearms Laboratory: A Pictorial Display,” 1979; 11(4):46.

Thompson, R.C., “Firearms Malfunction Worksheets,” 1983; 15(1):100.

Untitled insert, Newsletter #3, Oct. 1969, pp. 17, 18, 21.

Untitled insert, Newsletter #4, Dec. 1969, pp. 25, 27.

Reporting of Conclusions

“California Department of Justice Firearms Toolmark Identification Training Syllabus: Professionalism,” 1991; 23(2):719-726.

Bullet Recovery Systems

Arnold, R.R., and Gallant, R., “Bullet Recovery Tank For Under $1,500.00,” 1988; 20(2):168.

Ball, P., and Mikko, D., “Snail Passive Bullet Trap,” 1992; 24(1):82-83.

Cayton, J.C., “Firing Chamber & Safety Measures Taken in Firearm & Toolmark Work Environment,” 1985; 17(3):95.

---. “Horizontal Water Recovery Tank,” 1974; 6(1):23.

Dragan, P., and Miller, J., “Atlanta Forensic Science Laboratory Bullet Recovery Tank,” 1996; 28(1):1-2.

Dutton, G., “Firearms Safety in the Laboratory,” 1997; 29(1):37-41.

Eaton, T.R., “Simple Bullet Recovery Tool,” 1996; 28(3):191.

Freeman, R.A., “European Crime Laboratories,” 1977; 9(2):207.

Haag, L.C., “Inexpensive, Portable Bullet Recovery Device,” 1991; 23(1):522-523.

Heard, B.J., “Portable Water Recovery Tank,” 1980; 12(1):42.

Hueske, E.E., “Anti-Splash Back Lid for Water Traps,” 1988; 20(1):72-74.

Lansing, J.F., and Seestrom, J.L., “Cheap Water Recovery Tank,” 1975; 7(1):54.

Lansing, J.L., “Bullet Recovery in a Six Foot Cotton Box,” 1994; 26(4):286.

Lattig, K.N., and Kreiser, M.J., “Water Recovery Tank Safety,” 1982; 14(4):12.

Lee, F.R., “Horizontal Recovery Tank,” 1979; 11(2):48.

Lutz, M.C., “Source for Cotton Waste Recovery Materials,” 1985; 17(2):59.

McBrayer, W.S., “What? Another Water Tank and Bullet Stop,” 1978; 10(2):90.

Miller, K.E., “Description of Water Tank Bullet Recovery Units at Missouri State Highway Patrol,” 1971; 3(2):18.

Molnar, S., “Identification of 50 Caliber Machine Gun Bullets,” 1970; 2(1):22.
---. “Novel Bullet Recovery Method,” 1971; 3(5):17.

Moyer, F.A., “Chamber, Bullet Recovery, Water, Horizontal, MK1,” 1977; 9(1):32.

“New Ballistics Tank From Detroit Armor Corp,” 1984; 16(3):106.

Newquist, A.M., “Test Bullet Recovery System,” 1973; 5(1):9.

Reich, J.E., “New Method of Bullet Recovery,” 1978; 10(2):26.
Reitz, J.A., “Vertical Water Tank System Employing a Unique Method of Bullet Retrieval,” 1973; 5(6):12.
Skolrood, R.W., “Use of Dip-Pak as a Means of Bullet Recovery,” 1971; 3(6):17.

Wilhelm, R.M., “Ice Retrieval Method,” 1976; 8(2):82.

Ziegler, P.A., “Bullet Recovery Using Non Newtonian Fluids,” 1982: 14(3):43.

Cartridge Interchangeability

Barber, D., and Cassidy, F., “When is a Caliber 380 Auto Not a 380 Auto?,” 1993; 25(3):168-171.

Conrad, W.E., “Firing Pistol Ammunition in a Revolver,” 1980; 12(1):33.

Ernest, R.N., “Obsolete 256 Winchester Magnum Cartridge Causes Interesting Problems,” 1990; 22(2):200-201.

Green, K., “Cartridge Interchangeability,” 1983; 15(3):12.

Kopera, J., “Identification of a .32 Fired in a .380,” 1989; 21(3):513-515.

Marouka, R.K., “Firing a 9mm Cartridge in a 40 S&W,” 1992; 24(2):172-176.

---. “.223 Remington Versus 5.56 X 45mm: What’s the Difference?,” 1994; 26(1):50-63.

Nielsen, F.I., “Cartridge Interchangeability?,” 1983; 15(2):12.

Stengel, R.F., and Mills, D., “Revolver Cartridges in Automatics,” 1980; 12(3):68.

Thompson, E., “38 Super Fired in a Revolver,” 1991; 23(3):868.

Downloading Ammunition

Molnar, S., “Comment on Random Notes on Test Firing,” 1969; 1(3):14.

Smith, L.L., “Random Notes on Test Firing and Lab Techniques,” 1969; 1(2):19.

Remote Discharge of Firearms

Bates, J.S., “Firearms Test Stand,” 1973; 5(6):32.

Biasotti, A.A., “Vise/Rest for Remote Firing,” 1979; 11(4):16.

Lindman, D.A., and Moline, K.W., “Test Firing a Severely Damaged/ Dangerous Firearm,” 1994; 26(2):142-143.

Lutz, M.C., “Evaluating Zero-One New Testing Device for Firearms Examiners,” 1983; 15(4):28.

Uri, B., “Remote Controlled Device for Safe Discharge of Dangerous Firearms,” 1993; 25(2):116-124.

Voth, A.J., “Test Firing a Ruptured Shotgun Barrel,” 1997; 29(2):188-189.

Restoring Firearms to Operability

Denio, D.J., “Making a Rusted Gun Functional,” 1981; 13(3):29.
Garland, P.V., “Two Cases of Death Caused by Inoperable Firearms,” 1989; 21(1):85.

Basic References

Arnold, Automatic and Repeating Shotguns

Beeman, Air Gun Digest

Brownell, Encyclopedia of Modern Firearms, Parts and Assembly, Vol. I

Burrard, The Modern Shotgun

Chinn, The Machine Gun, Vols. I - IV

Department of the Army, U.S. Rifle, 7.62 mm, M14

Hicks, J.E., US Military Firearms

Hogg and Weeks, Military Small Arms of the Twentieth Century

Jane’s Annuals, Jane's Weapons Systems

Keith, Shotguns

MacFarland, Gunsmithing Simplified

McLean, Firearms Silencers

Mossberg & Sons, Mossberg Component Parts Catalog

Muntz, Gun Digest Book of Exploded Firearms Drawings

Musgrave and Nelson, The World's Assault Rifles

Nelson, The World's Submachine Guns

Nonte, George, Pistolsmithing

NRA Staff, The NRA Guidebook to Handguns

NRA Staff, NRA Guidebook to Shoulder Arms

NRA Staff, NRA Firearms Handling Handbook

NRA Staff, NRA Illustrated Shotgun Handbook

Remington Arms, Remington Component Parts Catalog

Savage Arms, Component Parts Catalog, Savage, Stevens, Fox, Springfield Sporting Arms

Smith & Smith, The Book of Rifles

Smith & Wesson, Smith & Wesson Component Parts Catalog

Smith, W.H.B., The Book of Pistols and Revolvers
Smith, W.H.B., Small Arms of the World

Stiendler, The Firearms Dictionary

Stoeger Arms, Stoeger Gun Parts Catalog

Stoeger Arms, Shooter's Bible

Swearengen, The World's Fighting Shotguns

Wesley, Air Guns and Air Pistols

Wirnsberger, The Standard Directory of Proof Marks

H. BULLET EXAMINATIONS AND COMPARISONS

1. Define what is meant by or determine the significance of the following terms or phrases as they relate to the examination and comparison of fired bullets. Discuss these with your Training Officer.

a.slippage
b.shaving
c.obturation
d.leading edge and trailing edge
e.melting
f.blow-by
g.striation
h.individual microscopic marks
i.ogive
j.bearing surface
k.class characteristics
l. general riflingm."insufficient individual microscopic marks"
n.corrosion
o.leading
p."limited individual microscopic marks"
q."single-action" firing
r."double-action" firing
s. knurled & grooved cannelure
t. stab crimp
u. Boattail
v. open base
w. closed base
x. recessed base
y. skived tip/hollow point
z. trace evidence aspects (lacquer, paint, painted tips)

(*Use Training Assignment #32 to complete this objective*.)

_____ _____
Training Officer Date

2. As they relate to the examination and comparison of fired bullets or bullet fragments, know the importance of, and limitations of, determining the following:

a. weight
b. caliber
c. caliber type
d. manufacturer
e. general rifling characteristics
f. pitch of rifling
g. depth of rifling
h. jacket construction/composition

Discuss this with your Training Officer.

(*Use Training Assignment #33 and Practical Exercise #9 to complete this objective*.)

_____ _____
Training Officer Date

3. Familiarize yourself with the Standard Ammunition File (SAF). Know how to search this file manually and by use of the computer in order to determine the manufacturer of fired bullets. Demonstrate your proficiency in using this file to your Training Officer.

(*Use Training Assignment #33 and Practical Exercise #9 to complete this objective*.)

_____ _____
Training Officer Date

4. Become familiar with the Known Specimen File *(if your laboratory maintains such a file)*. Know its location, composition, filing system, and uses as a reference file. Discuss this with your Training Officer.

(*Use Training Assignment #33 and Practical Exercise #9 to complete this objective*.)

_____ _____
Training Officer Date

5. Familiarize yourself with the General Rifling Characteristics (GRC) file. Know how to use this file to compile a list of firearms in a "no-gun case." Demonstrate your proficiency in using the GRC file to your Training Officer.

(*Use Training Assignment #33 and Practical Exercise #9 to complete this objective*.)

_____ _____
Training Officer Date

6. Using test bullets and other fired bullets and bullet fragments provided to you, demonstrate your proficiency in accurately determining caliber, caliber type, manufacturer, and rifling characteristics of these fired bullets. Also, prepare a list of firearms that could have been used to fire these bullets provided to you. As necessary, use the KSF, SAF, and GRC files in conducting these examinations.

(*Use Training Assignments #34 and #35 and Practical Exercises #8a and #10 to complete this objective*.)

_____ _____
Training Officer Date

7. Determine the methods and techniques used to differentiate between lead bullets and bullet cores.

(*Use Training Assignment #42 and Practical Exercise #16*.)

_____ _____
Training Officer Date

8. Using test bullets fired from polygonal rifled barrels, demonstrate your proficiency in accurately determining the rifling characteristics of these fired bullets. Compile a list of firearms that could have been used to fire these bullets using the GRC file.

(*Use Training Assignment #38 and Practical Exercise #13 to complete this objective*.)

_____ _____
Training Officer Date

9. Become knowledgeable about the facilities in the section for the recovery of fired test bullets. Know when and how to use the horizontal recovery tank and cotton boxes and their limitations. Observe and assist your Training Officer in the recovery of fired bullets using each of these methods. Know and observe all safety rules.

(*Use Training Assignment #39 and Practical Exercise #14 to complete this objective*.)

_____ _____
Training Officer Date

10. Familiarize yourself with the ammunition storage areas in the section. Know how to locate test ammunition after correctly selecting test ammunition using the SAF. Discuss with your Training Officer the reasons for using substitute ammunition or downloading ammunition for test firing. Know the proper procedure for downloading ammunition for test firing. Under supervision of your Training Officer prepare and fire downloaded test ammunition.

(*Use Training Assignment #39 and Practical Exercise #14 to complete this objective*.)

_____ _____
Training Officer Date

11. Test fire "*consecutively-made*" barrels and/or microscopically compare test bullets from "*consecutively-made*" barrels. Observe the differences and similarities in the striations and discuss this with your Training Officer.

(*Use Training Assignment #46 to complete this objective*.)

_____ _____
Training Officer Date

12. Using the same .22 caliber firearm, test fire two each of the following cartridges and attempt to identify the test bullets with each other. Take appropriate photographs and notes.

    a. .22 Long Rifle caliber Remington with lead bullets
    b. .22 Long Rifle caliber Winchester with lead bullets
    c. .22 Long Rifle caliber Remington with brass-coated lead bullets
    d. .22 Long Rifle caliber Winchester with copper-coated lead bullets
    e. .22 Long caliber Remington with lead bullets

    (*Use Training Assignment #40 and Practical Exercise #15 to complete this objective*.)

    _____ _____
    Training Officer Date

13. Using the same .357 Magnum caliber revolver, test fire two each of the following cartridges and attempt to identify the test bullets with each other. Take appropriate photographs and notes.

    a. .38 Special caliber Remington lead round-nosed bullet
    b. .38 Special caliber Remington jacketed bullet
    c. .357 Magnum caliber Remington jacketed bullet
    d. .357 Magnum caliber Winchester Silvertip bullet
    e. .357 Magnum caliber Federal Nyclad bullet

    (*Use Training Assignment #37 and Practical Exercise #13 to complete this objective*.)

    _____ _____
    Training Officer Date

14. Using the same 9mm Luger pistol, test fire two each of the following cartridges and attempt to identify the test bullets with each other. Take appropriate photographs and notes.

    a. 9mm Luger Federal Hydra-shok
    b. 9mm Luger PMC Starfire
    c. 9mm Luger Remington full metal jacket
    d. 9mm Luger Winchester Silvertip
    e. 9mm Luger CCI total metal jacket
    f. 9mm Luger Black Talon/Ranger SXT
    g. 9mm Luger Federal Nyclad

    (*Use Training Assignment #36 and Practical Exercise #11 to complete this objective*.)

    _____ _____
    Training Officer Date

15. Using a .22 caliber rifle, test fire and recover two test bullets and identify these bullets with each other. Cut off approximately three inches of the muzzle of the barrel and crown the muzzle end of the barrel. Test fire and recover two test bullets using the same ammunition as above. Microscopically compare these bullets with each other and with the previously fired test bullets.

(*Use Training Assignment #43 to complete this objective*.)

_____ _____
Training Officer Date

16. Using a 30 caliber rifle, test fire two each of the following cartridges and compare the tests with each other. Conduct this test with your Training Officer.

a. 30 caliber Remington jacketed soft-point bullet
b. 30 caliber Remington Accelerator cartridges
c. Test fire and inter-compare steel jacket bullets vs. Copper jacket bullets from the same barrel

(*Use Training Assignment #45 to complete this objective*.)

_____ _____
Training Officer Date

17. Using a .32 S & W caliber Harrington & Richardson revolver, test fire two each of the following cartridges and compare the test bullets with each other. Conduct this test with your Training Officer.

a. .32 S & W caliber Remington with lead bullet
b. .32 Auto caliber Remington with full metal case jacketed bullet

_____ _____
Training Officer Date

18. Test fire each of the following pistols. Using two test bullets from each pistol, make microscopic comparisons of the test bullets. Conduct this test with your Training Officer.

a. 9mm Glock pistol
b. 9mm H&K, Model P7, pistol
c. 9mm Steyr, Model GB, pistol

(*Use Training Assignment #45 to complete this objective*.)

_____ _____
Training Officer Date

19. Compile a list of reasons as to why bullet identifications cannot be made in some cases, and why some barrels and bullets can preclude or tend to preclude identifications. This list should include, but not be limited to, the results of the above testing.

(*Use Training Assignment #43 to complete this objective*.)

_____ _____
Training Officer Date

20. Discuss the significance of identifying manufacturing toolmarks on a fired bullet from a victim with those on unfired bullets loaded into cartridges from the suspect. Read the article in the April 1985 issue of the Crime Laboratory Digest concerning "*Manufacturing Toolmark Identification on the Base of Jacketed Bullets*."

(*Use Training Assignment #44 to complete this objective*.)

_____ _____
Training Officer Date

21. Discuss the feasibility of determining caliber and/or the rifling characteristics of a fired bullet from an examination of a bullet hole in metal.

(*Use Training Assignment #44 to complete this objective*.)

_____ _____
Training Officer Date

22. Test fire a .22 caliber firearm. Compare and identify test bullets with each other. Using this same firearm, "slug" the barrel and compare the previously fired test bullets with the bullets used to "*slug*" the barrel. Cut off approximately 25 percent of the barrel at the muzzle and "*slug*" this portion of the barrel and compare these tests with the previous test bullets. Conduct this exam with your Training Officer.

(*Use Training Assignment #43 to complete this objective*.)

_____ _____
Training Officer Date

23. Obtain a copy of and familiarize yourself with the Firearm Section protocol for the examination of fired bullets.

(*Use Training Assignment #44 to complete this objective*.)

_____ _____
Training Officer Date

REFERENCE MATERIALS
BULLET EXAMINATIONS AND COMPARISONS; SHOTSHELL PROJECTILES

The following reference materials serve several purposes:

- to provide a wider range of additional resources should you have a particular interest ina given topic.
- to provide reference materials for your future professional use.
- to allow you to gain additional depth in particular subject areas.

Should you encounter other references in this category, you are encouraged to make additional notes about them at the end of this listing.

General

Burrard, G., The Identification of Firearms and Forensic Ballistics, 1st edition, Charles Scribner Sons, NY, 1934, revised edition, A.S. Barnes & Co., NY, 1964.

Davis, J.E., An Introduction to Tool Marks, Firearms and the Striagraph, Charles C. Thomas, Springfield, IL, 1958.

FBI Laboratory, General Rifling Characteristics File, current edition.

Gunther, J.D., and Gunther, C.O., The Identification of Firearms, John Wiley and Sons, Inc., New York, 1935.

Hatcher, J.S., Hatcher's Notebook, Military Service Publishing Company, Harrisburg, PA, 1947.

Hatcher, J.S., Jury, F.J., and Weller, J., Firearms Investigation, Identification and Evidence, 2nd edition, Stackpole Books, Harrisburg, PA, 1957.

Heard, B.E., Handbook of Firearms and Ballistics: Examining and Interpreting Forensic Evidence, John Wiley & Sons, New York, 1997.

Mathews, J.H., Firearms Identification, Volumes I □ III, Charles C. Thomas, Springfield, IL, 1962.

NRA Firearms Fact Book, 3rd edition, National Rifle Association, Fairfax, VA, 1989.

AFTE Journal

Case Notes

"California Department of Justice Firearms Toolmark Identification Training Syllabus: Professionalism," 1991; 23(1):559-578.

Examination Protocols and Procedures

"California Department of Justice Firearms Toolmark Identification Training Syllabus: Professionalism," 1991; 23(2):703-715.

Worksheets

"California Department of Justice Firearms Toolmark Identification Training Syllabus: Professionalism," 1991; 23(2):713.

Howe, W.J., "Laboratory Work Sheets," Newsletter #2, Aug. 1969, p. 15.

Jordan, T.D., "Oklahoma State Bureau of Investigation Firearms Laboratory: A Pictorial Display," 1979; 11(4):46.

Untitled insert, Newsletter #3, Oct. 1969, pp. 19, 21.

Untitled insert, Newsletter #4, Dec. 1969, p. 25.

Reporting of Conclusions

"California Department of Justice Firearms Toolmark Identification Training Syllabus: Professionalism," 1991; 23(2):719-726.

General Rifling Characteristics

Anderson, C.E., "General Rifling Characteristics Using the Personal Computer," 1990; 22(4):431-433.

Anderson, C.E., Martinson, D., and Burnham, R., "Update of Houston's General Rifling Characteristics Computer System," 1991; 23(4):1005.

Baney, R.E., "Smith & Wesson Model's 39 and 59 Rifled 5 Right," 1978; 10(2):18.

---. "Smooth Bore Tanfoglio Pistol," 1992; 24(2):177-178.

Bell, P.D., and Mikko, D.M., "Iraqi Model 74 Semiautomatic Pistol," 1992; 24(1):23-27.

Berry, L., "Additional Information Concerning Sterling Arms Company," 1981; 13(2):16.

Biasotti, A.A., "Bullet Bearing Surface Composition: Variables: Fired Bullets," 1981; 13(2):94.

Bullock, J.J., "Interesting Rifling," 1982; 14(1):63.

Butler, D.J., "7mm Nambu," 1972; 4(4):30.

Butler, D.J., and Sachs, S., "Type 54 Tokarev Pistol," 1990; 22(2):160-162.

Carr, J.C., "Lorcin L25 A Barrel With Class," 1992; 24(1):17-21.

Carr, J., and Fadul, T., "Miami Barrel," 1997; 29(2):232-234.

Cashman, P.J., and Thornton, J.I., "Rapid Method for Determining Rifling Pitch," 1975; 7(3):21.

Cassidy, F.H., “Nomograph for Calculation of the Number of Lands and Grooves,” 1981; 13(4):67.

---. Reflections on Measurements of Land and Groove Dimensions,” 1983; 15(1):81.

Cayton, J.C., “Bullet Recovered From Jesse James Grave,” 1979; 11(3):57.

Chenow, R.W., “Mendoza Model K 62 Single Shot Pistol,” 1980; 12(2):28.

---. “Revolver/Pistol Rifling Class Characteristics,” 1979; 11(2):89.

---. “Rifling Change for Llama 22 Caliber Pistols,” 1983; 15(2):12.

Christansen, R.P., “Raven Arms,” 1977; 9(2):59.

Churchman, J.A., “Reproduction of Characteristics of Cooey Rifles,” 1981; 13(1):46.

“Criminalistics Laboratory Information System,” 1980; 12(3):72.

“Criminalistics Laboratory Information System,” 1980; 12(4):75.

Davis, J.E., “Land Impression Widths: A Simplified Measuring Set Up,” 1976; 8(4):14.

Denio, D.J., “Inverted Bullet Jacket,” 1982; 14(1):65.

Deobald, G.W., “Winchester Model 94: 6R vs. 4R,” 1977; 9(1):18.

Dragan, P., “Land & Groove Count from Bullet Cores,” 1978; 10(2):28.

Dunbar, D.A., “Identification of a Fired Sabot and a Distance Determination Involving a Shotshell Cartridge,” 1997; 29(1):26-29.

Ernest, R.N., “Bryco Arms Change in Rifling,” 1992; 24(1):22.

Fadul, T.G., “Pen Pistol,” 1995; 27(4):294-296.

Fournier, R.J., and Lemmer, J.T., “Type Sugiura: Oriental 32 ACP Pistol,” 1985; 17(2):38.

Fraser, D., “Further Information on the Enfield: Lee Enfield Confusion,” 1994; 26(3):173-175.

George, W., “Excam 25 ACP Pistol Design and Rifling Change,” 1989; 21(1):78.

---. “Smith & Wesson 10mm and Beretta 9mm,” 1990; 22(3):288-294.

Gieszl, R., “Bersa 380 Semiautomatic Pistols,” 1991; 23(3):862-866.

---. “Six Left Ruger Security-Six Revolver,” 1991; 23(4):1002-1003.

Gieszl, R., and Wolslagel, P., “Atypically Rifled SWD Cobray Pistols,” 1990; 22(3):328-329.

Goodman, R.E., Santora, D.N., and Trochum, T., “Kahr K9,” 1996; 28(3):166-167.

Haag, L.C., “Class Characteristics of Rifled Barrels,” 1978; 10(2):11.

Haag, L.C., and Petronino, J., “Colt: Right Twist Rifling,” 1974; 6(5-6):10.

Hamby, J.E., “Heckler & Koch Model 9 & 9s Pistol,” 1974; 6(2):16.

Harden, L.R., “Charter Arms Rifling Specifications & Serial Number Information,” 1972; 4(3A):29.

---. “Fox Carbine,” 1977; 9(2):119.

---. “Krieghoff Firearms,” 1977; 9(1):15.

---. “Rohm Manufacturing Plant,” 1978; 10(1):15.

---. “Savage Rifling Specifications,” 1972; 4(4):29.

Hart, R.P., “9MM Microgroove Bullet,” 1987; 19(3):310-311.

---. “Information on Weapons Frequently Encountered,” 1981; 13(4):51.

---. “Measurement and Value of Rate of Twist,” 1982; 14(3):27.

---. “Unrifled Bullet at 4000 FPS,” 1977; 9(1):55.

Heard, B.J., “Unusual Gun,” 1978; 10(3):41.

Heflin, T.F., “Rifling Characteristics for the Iver Johnson 38 Special Revolver,” 1985; 17(2):82.

---. “Ruger Model 77 300 Win Magnum GRC,” 1988; 20(2):205.

Howe, W.J., “Ruger Security Six Rifling Specifications,” 1973; 5(4):24.

Hueske, E.E., “Conversion Kit for a Colt Government Model,” 1988; 20(2):162.

Johnson, T.D., and Matty, W., “Arcadia Machine and Tool: Notes on A M T Firearms,” 1986; 18(3):69.

Jordan, T.D., and Looney, J., “Class Characteristics of Overpressured Cast Bullets,” 1981; 13(4):100.

Kennington, R.H., “Ordinance Manufacturing Corporation Model Back-Up,” 1977; 9(1):42.

---. “Pre-Rifled? .38 Caliber Bullet Cores,” 1988; 20(2):189.

Kent, R.H., “Thompson Center Contender Barrel Specifications,” 1983; 15(3):23.

Krcma, V.J., “Rifling Specifications, Sauer Revolvers,” 1969; 1(4):22.

Kreiser, M.J., “AMT Back-Up Pistol Manufacturer Marking Information,” 1984; 16(3):20.

Komar, S.M., “Unusual Rifling,” 1989; 21(4):653.

Larson, E.G., “Rifling Specifications on All Remington Firearms Currently Catalogued,” 1973; 5(4):30.

Laskowshi, G.E., “Identification of a Bullet to a Firearm Using a Barrel Cast,” 1997; 29(2):215-222.

Lomoro, V.J., “FIE Titanic Up-Date,” 1977; 9(2):64.

Lutz, M.C., “Four Plus Two Makes Three,” 1977; 9(2):38.

---. “Smoothbore 38 Special Derringer: Davis Industries Model D38,” 1996; 28(3):174-176.

---. “Smoothbore Semiautomatic Pistol,” 1994; 26(3):203-205.

Mason-Rooke, A., “Stripping and Axial Bullet Engraving,” 1981; 13(1):53.

Mathews, J.H., “Gain Rifling,” 1985; 17(2):100.

McBrayer, W.S., “380 Caliber Colt with 12 Lands & Grooves,” 1979; 11(4):22.

---. “Randall 45 Caliber Stainless Steel Pistol,” 1983; 15(3):16.

---. “RG-15 Derringer with Different Rifling,” 1987; 19(3):314.

Meyers, C.R., “North American Revolver with Faint Rifling,” 1985; 17(2):76.

---. “Wiping and General Rifling Characteristics,” 1970; 2(5):23.

Mikko, D., “Ceska Zbrojoka (CZ) Model 50 Semiautomatic Pistol,” 1993; 25(4):264-265.

Molnar, S., “Characteristics of the Erma .22 Caliber Luger Pistol,” 1970; 2(4):26.

---. “Rifling and Name Change Noted in 25 Caliber German-Made Auto Pistol,” 1969; 1(3):27.

---. “Rifling Changes Noted in Bauer & Guardian .25 Auto Pistol,” 1978; 10(1): 16.

---. “Rifling Impressions from Italian Made Firearms,” 1969; 1(4):40.

---. “Rifling Specifications in Some of the Firearm Replicas,” 1970; 2(2):8.

---. “Rifling Specifications of Newer .25 Caliber Pistols,” 1972; 4(4):6.

---. “Simplified Technique for L & G Measurement: Twist Rate,” 1969; 1(4):28.

---. “Technique for Counting Lands & Grooves,” 1971; 3(2):33.

---. “Torque Shifts in Rifling Impressions Indicate Direction of Rotation,” 1970; 2(2):2-13.

Monturo, C., “.410/.45 Colt Street Sweeper,” 1997; 29(1):19-20.

Munhall, B.D., “Weatherby Rifling Specifications,” 1972; 4(3):10.

Nennstiel, R., “Computer Supported Method of Firearm Type Determination,” 1986; 18(4):4.

Nielsen, F.I., “Heckler & Koch P7 (PSP),” 1981; 13(4):37.

Nordhoff, T.J., “Information on Colt 10mm Semiautomatic Pistols,” 1989; 21(1):86.

Parian, R.W., “Land and Groove Tabulation,” 1976; 8(1):15.

Pearl, A., “Unidentified Pistol,” 1974; 6(4):9.

Pearl, A., and Trusty, G.A., “German Derringer with Multiple Rifling Characteristics,” 1977; 9(2): 168.

Perkins, W.E., “Colt Revolver with Right Hand Twist,” 1969; 1(2):5.

Prystauk, G.S., “Encom MK IV Assault Pistol,” 1994; 26(3):176-180.

Reynolds, T.W., “Phoenix Arms (Model HP22),” 1995; 27(4):314.

Rios, F.G., and Thornton, J.I., “Comments on the Trigonometrical Basis of Bullet Twist Measurements,” 1983; 15(1):104.

Roberts, J.L., “Information on Gun Barrels Manufactured by Fred Kart,” 1982; 14(1):70.

Royse, D., “Identification Made on a Bullet Fired from an Unrifled Pistol,” 1995; 27(3):197.

Schecter, B., “Novel Training Weapon: A Sub-Caliber RPG,” 1986; 18(3):64.

Sham, P., “Smith and Wesson Model SW9F Pistol,” 1995; 27(2):152-153.

Smith, D., “Delu .25 Auto Caliber Vestpocket Pistol,” 1972; 4(2):33.

Sojat, J.G., and Hart, R.P., “Heckler & Koch Model HK-4 Pistol,” 1973; 5(2):19.

Stanton, R.B., “Bryco Arms Semiautomatic Pistol,” 1990; 22(2):194.

---. “Feather Model AT-9 Semiautomatic Carbine,” 1990; 22(3):333.

---. “Some Interesting Information From Amadeo Rossi Company,” 1974; 6(5-6):17.

Stauffer, J.C., “.38 S&W American Bulldog (Belgium),” 1973; 5(5):8.

Stengel, R.F., “Thoughts on Bullet Comparisons and No Gun Cases,” 1987; 19(3):306-307.

Striupaitis, P.P., “New 25 Caliber Pistol,” 1982; 14(4):8.

---. “New Over and Under: Rifle/Shotgun,” 1983; 15(2):9.

Templin,R.H., “Jennings, Model J-22 Semiautomatic Pistol Information,” 1987; 19(1):18.

Thompson, E., “Intratec Tec 22 Scorpion Pistol,” 1990; 22(1):51-54.

Thompson, E.J., “National Cartridge Rifled Sub Caliber Adapters,” 1988; 20(4):463-464.

Thornton, J.I., “Origin of the Term Land,” 1983; 15(4):8.

Trumble, C., “Ortgies Pocket Pistols,” 1997; 29(1):87-92.

---. “Raven Arms Company’s Gift to Crime Laboratories,” 1997; 29(1):93-97.

Uchiyama, T., and Nagai, M., “Rifle Markings of Titan 25 Caliber Semiautomatic Pistols,” 1986; 18(2):3.

---. “Rifle Markings of Titan 25 Caliber Semiautomatic Pistols,” 1989; 21(2):387-402.

Vaughan, R.T., and Gilman, P.L., “Information of the Rogak LES P18 Pistol,” 1985; 17(2):72.

Walch, W.N., and Wilhelm, R.M., “Uniform Bullet Classification System,” 1977; 9(2):26.

Walsh, J.F., “Accuracy Speed and Convenience in Rifling Measurements,” 1977; 9(1):50.

Warehime, L.E., “Remington Ammunition with Manufactured Lands & Grooves,” 1989; 21(1):76.

Warner, E.N., “Erma EP 25 Auto Pistol,” 1971; 3(2):28.

Whitmarsh, J.W., “Jennings Model J 22 Semiautomatic Pistol Information,” 1987; 19(1):18.

Williams, D.L., “In Reply to Land and Groove Count from Bullet Cores,” 1978; 10(3):31.

Zahn, M.S., “RPB Industries M10 Autoloading Pistol: New Rifling Observed,” 1981; 13(2):32.

---. “Smith & Wesson 9mm Autoloading Pistol Are Now Rifled 5R,” 1978; 10(1):6.

---. “Taurus Revolver Rifling Change,” 1979; 11(2):45.

Comparison Techniques

Barbetta, S., “Bullet Holding Adhesive,” 1987; 19(3):301.

Belveal, D.N., “Firearms Identification Based Upon Bullet Comparisons: Expertise or Guess-work?,” 1979; 11(2):9.

Conrad, W.E., “Comparisons of Nyclad Ammunition,” 1979; 11(4):116.

Janelli, R., and Geyer, G., “Smoking a Bullet,” 1977; 9(2):128.

Kennington, R.H., “Solution for Inconclusives,” 1997; 29(2):197-203.

McBrayer, W.S., “Effect of MAG-NA-PORT on Bullet Comparisons,” 1982; 14(1):34.

Molnar, S., “Firearms Tick Tack Toe: A Methodical Searching Technique,” 1972; 4(3):18.

Robinson, M.K., “Stikki-Wax,” 1982; 14(2):4.

Shem, R.J., “Modifying Mushroomed Bullet Jackets to Facilitate Comparisons,” 1993; 25(2):149-150.

Stengel, R.F., “Thoughts on Bullet Comparisons and No Gun Cases,” 1987; 19(3):306-307.

Thompson, E., and Caine, C., “AO Fiber Optic Light Diffusors,” 1987; 19(3):321.

Vander Werff, K., “Effect Changing and Altering Firearms Parts Has on Bullet and Cartridge Case Comparisons,” 1987; 19(3):316-317.

Wagoner, A.T., “Determination of a Possible Ammunition and Weapon Using a Multi Faceted Approach,” 1989; 21(4):629-632.

Ward, D., and Sibert, R., “Use of Vacuum Evaporation of Metals for Surface Feature Enhancement,” 1986; 18(4):76.

Automated Systems

Blackwell, R.J., and Framan, E.P., “Automated Firearms Identification System (AFIDS) Phase I,” 1980; 12(4):11.

Dillon, J.H., and Sibert, R.W., “FBI Laboratory’s DRUGFIRE Program,” 1990; 22(2): 216.

Gardner, G.Y., “Computer Identification of Bullets,” 1979; 11(2):26.

Masson, J.J., “Confidence Level Variations in Firearms: Identifications through Computerized Technology,” 1997; 29(1):42-44.

Moran, B., “Manual and Automated Bullet and Cartridge Case Comparison Systems: A Commentary,” 1997; 29(1):55-57.

Shutt, J., “CLIS: Ballistics Database Rifles Fast Reply on Gun Makes,” 1981; 13(1):43.

Thompson, R.M., Desrosiers, M., and Hester, S., “Computerized Image Analysis for Firearms Identification: The Integrated Ballistic Identification System: IBIS,” 1996; 28(3):194-203.

Uchiyama, T., “Automated Landmark Identification System,” 1993; 25(3):172-196.

Shotshell Components -General

Silliman, J.R., “Crime Scene Search: Evidence at the Scene of a Shotgun Shooting,” 1977; 9(2):111.

Watkins, R.L., and Haag, L.C., “Shotgun Evidence,” 1978; 10(3):10.

Shot Pellets

MacPhee, H.M., “Determination of Shot Content In Fired Shot Shells,” 1978; 10(2):24.

Mann, M.J., Espinza, E.O., Ralston, R.M., Stroud, R.K, Scanlan, M.D., and Strauss, S.J., “Shot Pellets: An Overview,” 1994; 26(3):223-241.

Mann, M.J., Ferguson, W., Henderson, C., and Stroud, R., “Analysis of Unusual Home Made Shot Pellets From Louisiana,” 1994; 26(3):242-250.

Shotshell Slugs

Arrowood, M.C., and Bullock, J.J., “Identification of a 12 Gauge Slug,” 1983; 15(2):58.

Ernest, R.N., “Exploring the Possibility of Matching Fired Shotgun Ammunition Components to Unaltered Shotguns,” 1992; 24(1):28-36.

Freels, R.H., “Comparison of a Shotshell Shot Collar to a Cut Barrel,” 1983; 15(3):21.

Galan, J.I., “Identification of a Rifled Slug Through Front Sight Defect,” 1986; 18(4):62.

Hueske, E.E., “Class Characteristics of Mossberg C-Lect-Choke Barrels with Factory Porting,” 1990; 22(4):401-407.

Royse, D., “Identification Made on a Fired 00 Buckshot Pellet,” 1996; 28(4):252-253.

Thompson, J., “Identification of a Rifled Slug,” 1994; 26(2):136-138.

Townshend, D.G., “Identification of Rifled Slugs,” 1970; 2(1):21.

Shotshell Wadding

Christansen, R.P., “Tricky Wads,” 1978; 10(1):27.

Edmondson, R., “Shotgun Sports,” 1990; 22(1):91.

---. “Shotgun Sports,” 1990; 22(1):90.

---. “Shotgun Sports,” 1990; 22(2):230.

---. “Shotgun Sports,” 1990; 22(2):230-231.

Franovich, J., “20 Gauge Filler Wads Used in 12 Gauge Shotgun Shells,” 1996; 28(2):92-94.

McJunkins, S.P., “Identification of Plastic Shotgun Waddings,” 1970; 2(4):24.

Buffer Material

Freels, R.H., and Wheeler, B.P., “Forensic Analysis of Shot Buffering Materials,” 1983; 15(2):31.

Hueske, E.E., “Forensic Aspects of Shotshell Buffers,” 1983; 15(2):26.

---. “Forensic Aspects of Shotshell Buffers,” 1989; 21(2):326-330.

Thornton, J.I., and Guarino, K., “Polyethylene Shotshell Buffer & Determination of Trajectory,” 1984; 16(3):132.

Manufacturing Marks

Crum, R.A., “Manufacturing Toolmark Identification on the Base of Jacketed Bullets,” 1987; 19(4):447-450.

Hamman, J.E., “Loading Machine Marks on Federal Shotshell Wads,” 1980; 12(1):36.

Kellet, P.M., “The Identification of a Tool Mark on the Interior of a Semi-Jacketed Bullet,” 1984; 16(3):22.

---. “The Comparison and Identification of Toolmarks on the Base of Remington Semi-Jacketed Bullets,” 1984; 16(3):81-83.

---. “The Comparison of Mold Marks on Cast Bullets and Punch Marks in Copper Gas Checks,” 1984; 16(3):104-106.

Kreiser, M.J., “Identification of Cast Bullets and Their Molds,” 1985; 17(3):88.

Nagai, M., and Uchiyama, T., “Identification of a Tool Mark on the Jacket of a Bullet,""1989; 21(1):80.

Skolrood, R.W., “Do Not Disregard Mould Markings,” 1975; 7(1):73-74.

I. CARTRIDGE/CARTRIDGE CASE EXAMINATIONS AND COMPARISONS

1. Describe "*class characteristics*" as the phrase applies to markings on a cartridge or a fired cartridge case. Determine the types of marks that may be left on a cartridge case/cartridge during loading/extracting and firing. Review videotape regarding the slow motion of firing sequences using semiautomatic firearms.

   (*Use Training Assignment #47 to complete this objective*.)

   _____ _____
   Training Officer Date

2. Test fire each of the following firearms at least twice. Using the test fired cartridge cases, visually relate the markings imparted to the fired cartridge case with the part on the firearm which produced these markings. Also load and extract at least two cartridges from each of the following firearms and visually relate the markings imparted to the unfired cartridges with the part on the firearm that will produced these markings.

   a. 9mm SWD Inc., M11/Nine, submachine gun
   b. 9mm Glock pistol
   c. .45 Auto caliber U.S. Pistol, Model 1911A1
   d. 9mm H&K, P7, pistol
   e. .22 Long Rifle caliber Ruger, MKII, pistol
   f. .22 Long Rifle caliber Ruger, 10/22, rifle

   (*Use Training Assignment #48 to complete this objective*.)

   _____ _____
   Training Officer Date

3. Using the test cartridge cases and cartridges from paragraph 2, above, microscopically examine all of the markings with each other. Include the following types of markings in your microscopic comparisons: firing pin impression, breechface marks, chamber marks, anvil marks, extractor marks, ejector marks, ramp marks, and slide drag marks, slide scuff marks, ejection port scuffmarks and magazine lip marks. Photograph the results of your comparisons.

   (*Use Training Assignment #48 to complete this objective*.)

   _____ _____
   Training Officer Date

4. Test fire the following firearms using comparable CCI, Remington, Federal, and Winchester ammunition of the appropriate caliber type for each firearm. Select ammunition with both nickel and brass primers. Test fire each firearm at least twice using each brand of ammunition. Microscopically examine and photograph the markings as in paragraph 3, above.

    a. .38 Special caliber Smith & Wesson, Model 10, revolver
    b. .357 Magnum caliber Smith & Wesson, Model 19, revolver
    c. 9mm Smith & Wesson, Model 669, pistol
    d. .22 Long Rifle caliber Colt, Woodsman, pistol

    (*Use Training Assignment #49 to complete this objective*.)

    _____ _____
    Training Officer Date

5. Test fire a .22 Long Rifle caliber Smith and Wesson revolver, fire six .22 Long Rifle caliber cartridges, six .22 Long caliber cartridges, and six .22 Short caliber cartridges of the same manufacturer. Mark each cartridge to note the chamber in which it is fired. Examine and photograph the markings imparted to the fired cartridge cases.

    (*Use Training Assignment #50 to complete this exercise*.)

    _____ _____
    Training Officer Date

6. Discuss the possibility of comparing and identifying reloading-type marks on cartridges/cartridge cases. Identify the various types of marks that may be indicative of reloaded ammunition. Become familiar with the reloading equipment in the Section and the procedures used in reloading cartridges. Reload several cartridges and compare reloading-type marks on these cartridges with each other.

    (*Use Training Assignment #51 to complete this objective*.)

    _____ _____
    Training Officer Date

7. Discuss the feasibility of comparing and identifying manufacturing toolmarks on a fired cartridge case from the scene of a crime with cartridges that can be associated with the suspect. Identify the various types of manufacturing toolmarks that may be present on cartridges or cartridge cases.

    (*Use Training Assignment #51 to complete this objective*.)

    _____ _____
    Training Officer Date

8. Test fire a .30 Carbine caliber U.S. Carbine and compare the test cartridge cases with each other. Compare all of the marks imparted to the fired cartridge cases. Load and extract cartridges from this same firearm. Note and compare all of the marks imparted to the test cartridges.

(*Use Training Assignment #52 to complete this objective*.)

_____ _____
Training Officer Date

9. Read the following two articles in the October 1989 issue of the AFTE journal and discuss them with your Training Officer.
   a. "Firing Pin Impressions - Their Measurement and Significance"
   b. "Firing Pin Impressions - Their Relation to Hammer Fall Conditions"

(*Use Training Assignment #47 to complete this objective*.)

_____ _____
Training Officer Date

10. Obtain a copy of and be familiar with the Firearm Section protocol for the examination of cartridges and cartridge cases.

(*Use Training Assignment #47 to complete this objective*.)

_____ _____
Training Officer Date

11. Compare test firings from various firearms before the breech and bore are cleaned and after the breech and bore are cleaned.

(*Use Training Assignment #53 to complete this objective*.)

_____ _____
Training Officer Date

12. Use a series of examinations that incorporates bullets, cartridge cases, firearms and the comparison microscope during an “on going investigation.”

(Use Practical Exercises #18 and #19 to complete this objective.)

_____ _____
Training Officer Date

REFERENCE MATERIALS
CARTRIDGE AND CARTRIDGE CASE EXAMINATIONS AND COMPARISONS

The following reference materials serve several purposes:

- to provide a wider range of additional resources should you have a particular interest in a given topic.
- to provide reference materials for your future professional use.
- to allow you to gain additional depth in particular subject areas.

Should you encounter other references in this category, you are encouraged to make additional notes about them at the end of this listing.

General

Burrard, G., The Identification of Firearms and Forensic Ballistics, 1st edition, Charles Scribner Sons, NY, 1934, revised edition, A.S. Barnes & Co., NY, 1964.

Datig, F.A., Cartridges for Collectors, Volumes I-III, Borden Publishing Co., 1956.

Davis, J.E., An Introduction to Tool Marks, Firearms and the Striagraph, Charles C. Thomas, Springfield, IL, 1958.

Gunther, J.D., and Gunther, C.O., The Identification of Firearms, John Wiley and Sons, Inc., New York, 1935.

Hatcher, J.S., Hatcher's Notebook, Military Service Publishing Company, Harrisburg, PA, 1947.

Hatcher, J.S., Jury, F.J., and Weller, J., Firearms Investigation, Identification and Evidence, 2nd edition, Stackpole Books, Harrisburg, PA, 1957.

Heard, B.E., Handbook of Firearms and Ballistics: Examining and Interpreting Forensic Evidence, John Wiley & Sons, New York, 1997.

Horn, W.R., Headstamps and Cartridge Identification Data, Horn Co., 1962.

James, C.R., "Fluted and Annular-Grooved Chamber Markings," paper delivered at the AFTE annual training seminar, Tampa, 1998.

Kennington, R.H., The Matrix: 9mm Parabellum An Empirical Study of Type Determination, 1992.

Krcma, V., "Fluted and Annular Grooved Barrel Chambers in Firearms," Journal of Forensic Sciences, Vol. 41, No. 3, May 1966, pp. 407-417.

Mathews, J.H., Firearms Identification, Volumes I-III, Charles C. Thomas, Springfield, IL, 1962.

McClean, D.B., Small Arms Ammunition Identification Guide, Normount Technical Publications, 1971.

NRA Firearms Fact Book, 3rd edition, National Rifle Association, Fairfax, VA, 1989.
White, H.P., and Munhall, B.D., Cartridge Headstamp Guide, H.P. White Laboratory, 1963.

---. Pistol and Revolver Cartridges, H.P. White Laboratory, 1963.

AFTE Journal

Case Notes

"California Department of Justice Firearms Toolmark Identification Training Syllabus: Professionalism," 1991; 23(1):559-578.

Examination Protocols and Procedures

"California Department of Justice Firearms Toolmark Identification Training Syllabus: Professionalism," 1991; 23(2):703-715.

Worksheets

"California Department of Justice Firearms Toolmark Identification Training Syllabus: Professionalism," 1991; 23(2):714.

Jordan, T.D., "Oklahoma State Bureau of Investigation Firearms Laboratory: A Pictorial Display," 1979; 11(4):47.

"Laboratory Work Sheets," Newsletter #2, Aug. 1969, p. 15.

Untitled insert, Newsletter #3, Oct. 1969, pp. 19-20.

Untitled insert, Newsletter #4, Dec. 1969, p. 25.

Reporting of Conclusions

"California Department of Justice Firearms Toolmark Identification Training Syllabus: Professionalism," 1991; 23(2):719-726.

Jordan, T.D., "Oklahoma State Bureau of Investigation Firearms Laboratory: A Pictorial Display," 1979; 11(4):50.

General

Bouley, B., "Determination of Firing Sequence by Cartridge Case Markings," 1995; 27(3):237-241.

Byrd, S.C., "Misleading Cartridge Case Markings," 1989; 21(3):522-523.

Davis, J.E., "Test Toolmarks from Weapon Parts May Facilitate Comparisons," 1972; 4(3A):28.
Hart, R.P., "Information on Weapons Frequently Encountered," 1981; 13(4):51.

Heard, B.J., "Case of Interest," 1978; 10(2):21.

Hurst, F.M., "Unusual Brand of Pistol," 1973; 5(6):29.

Kennington, R.H., and Galan, J.I., “Ejector Type Marks on Unfired Cartridges,” 1987; 19(4):452.

Lapierre, J.A.G., “Additional Identifying Features Dealing with Revolvers,” 1978; 10(3):36.
McGuire, D.L., “Potentially Incorrect Weapon Identification,” 1972; 4(3):30.

McKay, S.A., “Class Characteristics of Shotguns from Shell Markings,” 1971; 3(3):34.

Nennstiel, R., “Computer Supported Method of Firearm Type Determination,” 1986; 18(4):4.

Rathman, G.A., “Unusual Cartridge Case Identification,” 1976; 8(4):29.

Stengel, R.F., “Which Cartridge Was Fired First?,” 1987; 19(3):325-326.

Walsh, K.A., and Buckleton, J.S., “Firing Sequence Involving Two 303 British Cartridges,” 1991; 23(3):816-819.

Welch, N.E., “Matching a Bullet to a Cartridge Case,” 1981; 13(4):79.

Headstamps

Al Khalifa, A.K., “Headstamps With Arabic Markings,” 1983; 15(2):64.

Anderson, E.J., “Headstamps of 5.56mm and 7.62mm Cartridges, Reportedly Manufactured in Singapore,” 1974; 6(1):21.

Barabash, T., “New Cartridge,” 1978; 10(3):46.

Bates, J.S., “Another Ammunition Oddity,” 1973; 5(4):22.

Berg, S.O., “Could You Have Identified It?,” 1970; 2(10):32.

---. “Interesting Headstamp,” 1970; 2(7):22.

---. “Interesting Headstamp,” 1971; 3(4):14.

Bridgemon, R.R., “Aguila Cartridges,” 1985; 17(2):116.

Clanet, C., “French Small Firearm Cartridge Headstamps,” 1972; 4(2):26.

Canning, D.R., “Headstamps for Stud Guns,” 1976; 8(1):53.

Cassidy, F.H., “What Caused the Unusual Headstamp Mark?,” 1989; 21(4):655.

Dougherty, P.M., “Eldorado Cartridge Corporation Headstamps,” 1990; 22(4):443.
Edwards, R.L., “Circumferential Fractures,” 1991; 23(3):806-807.

---. “New Type of Ammunition by MFS (Matravideki Femmuvek),” 1993; 25(4):254-258.

Ernest, R.N., and Fite, K., “Remington Cartridge Made By Winchester,” 1989; 21(3):520.

Garland, P.V., “Color Code Identification of Small Arms Cartridges,” 1974; 6(2):27.

---. “Headstamp Designator +P,” 1974; 6(2):10.

Gieszl, R., “New Ammunition,” 1982; 14(1):40.

Green, K., “Remington Announces a New Headstamp for Rimfire,” 1983; 15(3):18.
Haag, L.C., “Korean Ammunition Available in North America,” 1981; 13(1):7.

---. “Stirling .22 Rimfire Ammunition,” 1977; 9(2):226.

Hall, J.M., “American Ballistics Grand Slam Cartridge,” 1991; 23(2):679-681.

Hamby, J.E., “Information on Delay Cartridges,” 1974; 6(1):5.

---. “Japanese Ammunition Information,” 1976; 8(2):19.

---. “New Headstamp on KTW Metal Piercing Cartridges,” 1971; 3(5):16.

---. “Tests on the Squibman .22 Caliber Cartridge,” 1971; 3(2):29.

---. “Two New Cartridges,” 1978; 10(3):47.

Hampton, H.L., “Letter From SAAMI: Headstamp Explanation,” 1974; 6(2):14.

Harden, L.R., “Geco Headstamp Information,” 1973; 5(3):10.

---. “Hi-Jacker Cartridge,” 1977; 9(1):39.

Heard, B.J., “Ammunition Information,” 1983; 15(1):65.

---. “New CBC Ammunition,” 1983; 15(2):16.

“Headstamps,” 1991; 23(3):874-875.

Heflin, T.F., “9MM Steyr Cartridge Conversions,” 1987; 19(3):262-265.

---.” Information on Various Cartridges,” 1985; 17(2):85.

Interpol, “Cartridge Identification,” 1976; 8(4):72.

---. “Cartridge Identification,” 1977; 9(1):69.

---. “Interpol: Cartridge Information,” 1976; 8(2):112.

Johnson, T.D., “Imported Ammunition,” 1979; 11(1):36.

Johnson, T.D., and Matty, W.G., “Starline Brass,” 1984; 16(4):60.

Kass, G.A., “Ammunition Information: Manufacturer & Headstamp,” 1983; 15(2):9.

---. “Headstamps,” 1990; 22(3):346-347.

---. “Headstamps,” 1991; 23(2):659.

Kellett, P.M., “Egyptian Headstamp,” 1990; 22(2):226.

---. “Toolmarks on the Case of Remington Semi-Jacketed Bullets,” 1984; 16(3):81.

Lambert, R.R., “Ammunition Headstamps,” 1972; 4(3):36.

Lomoro, V.J., “.22 Short, .22 Long Rifle and Now the .22 In-Between,” 1975; 7(2):33.

Lorsbach, L.A., “Dots Make a Difference,” 1976; 8(2):15.

Lutz, M.C., “Explosive Projectiles for Small Arms,” 1973; 5(1):12.

---. “Special .380 Submachine Gun Cartridge for MAC (Ingram) SMG,” 1972; 4(3A):35.

---. “Winchester & Hirtenberg Ammunition Sold by Sears Roebuck & Federal Cartridge Co.,” 1974; 6(4):14.

Matthews, J.W., “9X19 SP Headstamp,” 1980; 12(1):40.

Matty, W., “Wahib Arms Ammunition Information,” 1983; 15(1):68.

Moline, K., and Lansing, J., “Ammunition Information,” 1993; 25(3):204-205.

Molnar, S., “Observation While Firing HP Ammunition,” 1971; 3(5):6.

Nennstiel, R., “Collection of Headstamps and Projectiles,” 1985; 17(4):7.

Nicholson, T., “Headstamp Oddity,” 1970; 2(3):31.

Nielsen, F.I., “Unusual Head Stamps,” 1973; 5(5):27.

Poust, W.R., “Headstamp Impressions in Oily Residue,” 1987; 19(3):300.

---. “Observation of Different Headstamps in Same Box of Ammunition,” 1982; 14(2):12.

“Smith & Wesson Information,” 1979; 11(1):22.

Smith, A.G., “Cartridges Offered by Centennial Arms Corporation,” 1974; 6(3):16.

Smith, O.C., “Headstamps from Desert Storm,” 1993; 25(2):110-111.

Smith, R.J., “Star Ammunition,” 1975; 7(3):57.

Steidler, R.A., “Caliber .22 Ammunition With B Headstamp,” 1973; 5(1):27.

Stubits, F., “New Cartridge: The 22 Caliber Devastator,” 1981; 13(3):15.

Tokano, K., “Double Marked WW Headstamp,” 1989; 21(4):583.

Tulleners, F.A., “New Headstamp Cascade Cartridge International,” 1979; 11(2):87.

Waite, M.D., “Identification of Browning Arms Co Ammunition,” 1973; 5(3):26.

Woodin, W.H., “Military and Police Ammunition Research Identification,” 1981; 13(4):102.

Specific Models and Mechanism Marks

Carr, J.C., “AMT Automag II Identification by Dots,” 1990; 22(2):163-166.

---. “Lorcin L25 A Barrel With Class,” 1992; 24(1):17-21.

Celovsky, J.R., “Heckler & Koch, Model HK4 Pistol, Additional Outstanding Class Characteristics,” 1973; 5(5):23.

Celovsky, J.R., and Lemmer, J.T., “Heckler & Koch Pistol, Model VP702 9mm Parabellum,” 1984; 16(3):108.

Dujanovich, M.B., “Heckler & Koch 9x19mm Firearms,” 1995; 27(4):297-302.

---. “Navy Arms Model TU90 Semiautomatic Pistol,” 1994; 26(2):121-126.

Fournier, R.J., and Lemmer, J.T., “Type Sugiura: Oriental 32 ACP Pistol,” 1985; 17(2):38.

Garland, P.V., “SATA Semiautomatic Pistol,” 1970; 2(7):23.

Gieszl, R., “Bersa 380 Semiautomatic Pistols,” 1991; 23(3):862-866.

Kennington, R.H., “380 Auto Arcology: The Firing Pin Ejector Models,” 1996; 28(2):82-91.

---. “Ordinance Manufacturing Corporation Model Back-Up,” 1977; 9(1):42.

Kreiser, M.J., “Unusual Cartridge Marking by a Model 39 Smith & Wesson,” 1983; 15(4):13.

Lutz, M.C., “Central Kentucky Arms Semiautomatic Rifle,” 1983; 15(4):40.

Maciejewski, K., “Possible Identification Feature: .22 Caliber Smith & Wesson Model 61 Pistol,” 1970; 2(5):38.

Molnar, S., “Characteristics of the Erma .22 Caliber Luger Pistol,” 1970; 2(4):26.

Nichols, R.G., “Glock Versus Smith and Wesson Model SW40F: Comparison of Markings on Fired Cartridge Cases,” 1995; 27(2):133-139.

Reynolds, T.W., “Phoenix Arms (Model HP22),” 1995; 27(4):314.

Shem, R.J., and Striupaitis, P.P., “Fired Bullets & Cartridge Cases from Raven Pistol,” 1983; 15(3):109.

Sojat, J.G., and Hart, R.P., “Heckler & Koch Model HK-4 Pistol,” 1973; 5(2):19.

Stauffer, J.C., “Caliber .25 Sterling Auto Pistol,” 1972; 4(5):30.

Thompson, E., “Intratec Tec 22 Scorpion Pistol,” 1990; 22(1):51-54.

Firing Pin Impressions

Cochrane, D.W., “Firing Pin or Ejector?,” 1981; 13(4):106.

Fraser, D.A., “Rimfire Firing Pin Impressions,” 1983; 15(3):85.

Frazier, R.A., “Firing Pin Impressions: Their Relationship To Hammer Fall Conditions,” 1989; 21(2):589-92.

Haag, L.C., “Firing Pin Protrusion and Impression Depth Measurement,” 1990; 22(3):295-298.

Matty, W., and Johnson, T., “Comparison of Manufacturing Marks on Smith & Wesson Firing Pins,” 1984; 16(3):51.
McBrayer, W.S., “Unique Firing Pin Impression,” 1981; 13(4):116.

Miller, J., “Pressure Effects on Firing Pin Impression Depth,” 1995; 27(3):242-245.

Nielsen, F.I., “Ruger 10/22 Firing Pin Modification,” 1988; 20(3):325.

Ojena, S.M., and Murdock, J.E., “Evaluation of an Alibi: Relative Firing Pin Impression Depths,” 1981; 13(3):79.

Stephenson, J.S., McPhillips, E.T., and Jachimowicz, E., “Use of a Duplex Nail as a Firing Pin in the Intratec Tec-9 Pistol,” 1996; 28(1):15-18.

Verbeke, D.J., and Stauffer, J.C., “Unique Firing Pin Identification,” 1975; 7(1):59.

Anvil Marks

Dutton, G., “Anvil Bounce,” 1996; 28(4):243-246.

Ernest, R.N., “Anvil Marks in Centerfire Cartridge Cases,” 1992; 24(4):367-370.

Gieszl, R., “Don’t Forget 22 Rimfire Anvil Marks,” 1991; 23(4):997-999.

Tuira, Y.J., and Ziegler, P.A., “Anvil Bounce,” 1995; 27(4):318-319.

Manufacturing Marks

Dutton, G., “Manufacturing Marks on 12 Gauge Cartridges,” 1997; 29(2):170-172.

Klees, G., “Aberrant Manufacturing Marks on Federal Ammunition,” 1997; 29(1):21-23.

LaVoy, T.A., and Willmer, J.H., “Toolmarkings From a Reloading Die,” 1979; 11(2):37.

Matty, W., “Persistence of Toolmarks in the Cartridge Case Head Forming Process,” 1983; 15(1):108.

Quirk, T.W., “Toolmarks on Primers of □Rio’ Brand Ammunition,” 1987; 19(3):309-310.

Robinson, M.K., “Another Manufactured Toolmark,” 1996; 28(3):164-165.

Swim, J.D., “Firearms Examiners Beware,” 1979; 11(1):33-34.

Breech Face Marks

Cook, C.W., “Breech Face Markings from a Non Operable Weapon,” 1983; 15(4):53.

Esposito, A.J., “Apparent Mirror Image Breech Face Marking in the Stevens Model 311 Side by Side Shotgun,” 1995; 27(3):200-201.

Matty, W., “Raven 25 Automatic Pistol Breech Face Toolmarks,” 1984; 16(3):57.

Molnar, S., “False Breech Face ID’s,” 1996; 28(2):95-96.

---. “Marks of Spanner Wrench Holes in Firing Pin Escutcheons,” 1970; 2(7):34.

---. “Notes on Breech Face Marks and Fouling,” 1977; 9(1):21.
Thompson, E., “Davis Derringer Breech Face Markings,” 1996; 28(3):177-178.

Uchiyama, T., “Similarity Among Breech Face Marks Fired from Guns with Close Serial Numbers,” 1986; 18(3):15.

Wilson, R.J., “Mikrosil Breech Face Comparison,” 1983; 15(4):24.

Chamber Marks

Della Penna, A., “Chamber Markings?,” 1974; 6(2):22.

Dickinson, J.A.H., “Identification of Firearms by Chamber Marks on the Expended Cartridge Case,” 1976; 8(1):25.

Hamby, J.E., “Adapter Cartridges & Insert Barrels,” 1979; 11(4):23.

---. “Cartridge Adapters,” 1975; 7(3):16.

Hofmeister, A.G., “Revolver Chamber Markings,” 1979; 11(2):42.

Miller, J., “Chamber Marks from Dry-Fire Damage,” 1992; 24(2):162-164.

Shem, R.J., “Fireformed Chamber Striations on Rimfire Cartridge Cases,” 1987; 19(3):282-283.

Thompson, E., “Odd Chamber Markings in a 9mm Armi Tanfoglio Pistol,” 1992; 24(1):61-62.

Bunter Marks

Dodson, R.V., and Masson, J.J., “Bunter Marks: What Do They Mean,” 1997; 29(1):33-36.

Johnson, T.D., and Matty, W.G., “Starline Brass,” 1984; 16(4):60.

Matty, W., “Persistence of Toolmarks in the Cartridge Case Head Forming Process,” 1983; 15(1):108.

Zahn, M.S., “Unique Markings on a Shotshell Head Due to a Worn or Chipped Bunter Tool,” 1984; 16(3):8.

Basic References:

Ackley, P.O., Handbook for Shooters & Reloaders

Hodgon Powder Co., Hodgdon's Reloading Data Manual

Hornaday Staff, Hornaday Handbook of Cartridge Reloading

NRA Staff, The NRA Handloader's Guide

Rumage, Lyman Cast Bullet Handbook

Sharpe, Complete Guide to Hand Loading

Shooter's Bible, Reloader's Guide

Sierra Staff, Sierra Bullets Reloading Manual

Speer Staff, Speer Reloading Manual

J. SHOTSHELL AND SHOTSHELL COMPONENT EXAMINATIONS AND COMPARISONS

1. Determine what type of examinations may be conducted and what conclusions can be reached from an examination of the following components. Discuss this with your Training Officer.

    a. Shot, deformed and undamaged
    b. Fired card or fiber wads
    c. Fired plastic wads
    d. Fired shotshell casings
    e. Unfired shotshells
    f. Shot buffer material
    g. Shot collar and shot cup

    (*Use Training Assignment #55 and Practical Exercise #17 to complete this objective*.)

    _____ _____
    Training Officer Date

2. Familiarize yourself with the use of the SAF in regard to the determination of gauge and manufacturer of fired shotshell components. Know the limitations in regard to making such determinations. Demonstrate your proficiency in using the SAF to conduct this type of search to your Training Officer.

    (*Use Training Assignment #54 to complete this objective*.)

    _____ _____
    Training Officer Date

3. Using a shotgun, saw off a portion of the barrel. Test fire this shotgun using a Remington shotshell with a power piston wad. Recover the test shotshell wads and make microscopic comparisons of marks imparted to the test wads.

    (*Use Training Assignment #58 to complete this objective*.)

    _____ _____
    Training Officer Date

4. Test fire the following shotguns using at least two test shotshell casings from each shotgun and microscopically compare the marks imparted to these shotshell casings. Include in your comparisons the following types of marks: firing pin impression, breechface marks (*primer, battery cup, and head*), extractor marks, ejector marks, chamber marks, and any other mechanism marks. Photograph these marks and discuss the significance of identifying any of these types of marks.

   a. Marlin, Model 55, bolt action shotgun
   b. 12-gauge Remington, Model 1100, shotgun
   c. 12-gauge Mossberg, Model 500, shotgun
   d. J.C. Higgins, Model 1011, top-break single shot shotgun
   e. 12-gauge Beretta, Silver Snipe, shotgun
   f. Stevens, Model 311, side by side double barrel shotgun

   (*Use Training Assignment #56 to complete this objective*.)

   _____ _____
   Training Officer Date

5. Using a 12-gauge Remington, Model 1100, shotgun, obtain at least two test shotshell casings with each of the following types of ammunition. Also, recover a representative number of the fired pellets and fired wadding from each test firing. Compare markings on these test shotshell casings with each other. Examine the fired components that are recovered and compare them to unfired components of the same type. Discuss the significance of your findings.

   a. 12-gauge Remington, 2 3/4" Magnum, 00 Buck
   b. 12-gauge Remington, 2 3/4" Shur-Shot, #8 shot
   c. 12-gauge Federal, 2 3/4" Magnum, 00 Buck
   d. 12-gauge Federal, 2 3/4" Field load, #9 shot
   e. 12-gauge Activ, 2 3/4" Field load, #7 shot
   f. 12-gauge Activ, 2 3/4" Magnum, BB shot
   g. 12-gauge Winchester, 2 3/4" Xpert, #6 shot
   h. 12-gauge Winchester, 2 3/4" Super-X, #7 shot

   (*Use Training Assignment #57 to complete this exercise*.)

   _____ _____
   Training Officer Date

6. Discuss in detail the procedures used in reloading shotshells and familiarize yourself with the shotshell reloading equipment in the Firearm Section. Know how to recognize reloaded shotshells from an examination of the shotshell casing and/or its components. Reload shotshells using the shotshell reloading equipment in the section and examine the reloaded shotshells for reloading-type marks.

   (*Use Training Assignment #59 to complete this objective*.)

   _____ _____
   Training Officer Date

7. Research the current U.S. shot sizes and weights and obtain a chart reflecting the data. Familiarize yourself with the variations worldwide in shot size and composition. Learn the significance of the "*Rule of 17*" as it applies to shot size.

(*Use Training Assignment #54 to complete this objective*.)

_____ _____
Training Officer Date

REFERENCE MATERIALS
SHOTSHELL AND FIRED SHOTSHELL EXAMINATIONS AND COMPARISONS

The following reference materials serve several purposes:

- to provide a wider range of additional resources should you have a particular interest in a given topic.
- to provide reference materials for you're future professional use.
- to allow you to gain additional depth in particular subject areas.

Should you encounter other references in this category, you are encouraged to make additional notes about them at the end of this listing.

General

Burrard, G., The Identification of Firearms and Forensic Ballistics, 1st edition, Charles Scribner Sons, NY, 1934, revised edition, A.S. Barnes & Co., NY, 1964.

Datig, F.A., Cartridges for Collectors, Volumes I-III, Borden Publishing Co., 1956.

Davis, J.E., An Introduction to Tool Marks, Firearms and the Striagraph, Charles C. Thomas, Springfield, IL, 1958.

Gunther, J.D., and Gunther, C.O., The Identification of Firearms, John Wiley and Sons, Inc., New York, 1935.

Hatcher, J.S., Hatcher's Notebook, Military Service Publishing Company, Harrisburg, PA, 1947.

Hatcher, J.S., Jury, F.J., and Weller, J., Firearms Investigation, Identification and Evidence, 2nd edition, Stackpole Books, Harrisburg, PA, 1957.

Heard, B.E., Handbook of Firearms and Ballistics: Examining and Interpreting Forensic Evidence, John Wiley & Sons, New York, 1997.

Horn, W.R., Headstamps and Cartridge Identification Data, Horn Co., 1962.

James, C.R., "Fluted and Annular-Grooved Chamber Markings," paper delivered at the AFTE annual training seminar, Tampa, 1998.

Kennington, R.H., The Matrix: 9mm Parabellum An Empirical Study of Type Determination, 1992.

Krcma, V., "Fluted and Annular Grooved Barrel Chambers in Firearms," Journal of Forensic Sciences, Vol. 41, No. 3, May 1966, pp. 407-417.

Mathews, J.H., Firearms Identification, Volumes I-III, Charles C. Thomas, Springfield, IL, 1962.

McClean, D.B., Small Arms Ammunition Identification Guide, Normount Technical Publications, 1971.

Remage, Lyman Shotshell Hand Book, Third Edition.

NRA Firearms Fact Book, 3rd edition, National Rifle Association, Fairfax, VA, 1989.

White, H.P., and Munhall, B.D., Cartridge Headstamp Guide, H.P. White Laboratory, 1963.

---. Pistol and Revolver Cartridges, H.P. White Laboratory, 1963.

AFTE Journal

Case Notes

"California Department of Justice Firearms Toolmark Identification Training Syllabus: Professionalism," 1991; 23(1):559-578.

Examination Protocols and Procedures

"California Department of Justice Firearms Toolmark Identification Training Syllabus: Professionalism," 1991; 23(2):703-715.

Worksheets

"California Department of Justice Firearms Toolmark Identification Training Syllabus: Professionalism," 1991; 23(2):714.

Jordan, T.D., "Oklahoma State Bureau of Investigation Firearms Laboratory: A Pictorial Display," 1979; 11(4):47.

"Laboratory Work Sheets," Newsletter #2, Aug. 1969, p. 15.

Untitled insert, Newsletter #3, Oct. 1969, pp. 19-20.

Untitled insert, Newsletter #4, Dec. 1969, p. 25.

Reporting of Conclusions

"California Department of Justice Firearms Toolmark Identification Training Syllabus: Professionalism," 1991; 23(2):719-726.

Jordan, T.D., "Oklahoma State Bureau of Investigation Firearms Laboratory: A Pictorial Display," 1979; 11(4):50.

Plastic Shotshells

Gallant, J.J., "Will Plastic Shotshells Hinder Firearms Identification?," 1987; 19(1):17.

Mason, J.J., "Unusual Identification of All-Plastic Shotshell Cases," 1989; 21(4):635.

General

Bouley, B., “Determination of Firing Sequence by Cartridge Case Markings,” 1995; 27(3):237-241.

Byrd, S.C., “Misleading Cartridge Case Markings,” 1989; 21(3):522-523.

Davis, J.E., “Test Toolmarks from Weapon Parts May Facilitate Comparisons,” 1972; 4(3A):28.

Hart, R.P., “Information on Weapons Frequently Encountered,” 1981; 13(4):51.

Heard, B.J., “Case of Interest,” 1978; 10(2):21.

Hurst, F.M., “Unusual Brand of Pistol,” 1973; 5(6):29.

Kennington, R.H., and Galan, J.I., “Ejector Type Marks on Unfired Cartridges,” 1987; 19(4):452.

Lapierre, J.A.G., “Additional Identifying Features Dealing with Revolvers,” 1978; 10(3):36.

McGuire, D.L., “Potentially Incorrect Weapon Identification,” 1972; 4(3):30.

McKay, S.A., “Class Characteristics of Shotguns from Shell Markings,” 1971; 3(3):34.

Nennstiel, R., “Computer Supported Method of Firearm Type Determination,” 1986; 18(4):4.

Rathman, G.A., “Unusual Cartridge Case Identification,” 1976; 8(4):29.

Stengel, R.F., “Which Cartridge Was Fired First?,” 1987; 19(3):325-326.

Walsh, K.A., and Buckleton, J.S., “Firing Sequence Involving Two 303 British Cartridges,” 1991; 23(3):816-819.

Welch, N.E., “Matching a Bullet to a Cartridge Case,” 1981; 13(4):79.

Headstamps

Al Khalifa, A.K., “Headstamps With Arabic Markings,” 1983; 15(2):64.

Anderson, E.J., “Headstamps of 5.56mm and 7.62mm Cartridges, Reportedly Manufactured in Singapore,” 1974; 6(1):21.

Barabash, T., “New Cartridge,” 1978; 10(3):46.

Bates, J.S., “Another Ammunition Oddity,” 1973; 5(4):22.

Berg, S.O., “Could You Have Identified It?,” 1970; 2(10):32.

---. “Interesting Headstamp,” 1970; 2(7):22.

---. “Interesting Headstamp,” 1971; 3(4):14.

Bridgemon, R.R., “Aguila Cartridges,” 1985; 17(2):116.

Clanet, C., “French Small Firearm Cartridge Headstamps,” 1972; 4(2):26.

Canning, D.R., “Headstamps for Stud Guns,” 1976; 8(1):53.

Cassidy, F.H., “What Caused the Unusual Headstamp Mark?,” 1989; 21(4):655.

Dougherty, P.M., “Eldorado Cartridge Corporation Headstamps,” 1990; 22(4):443.

Edwards, R.L., “Circumferential Fractures,” 1991; 23(3):806-807.
---. “New Type of Ammunition by MFS (Matravideki Femmuvek),” 1993; 25(4):254-258.

Ernest, R.N., and Fite, K., “Remington Cartridge Made By Winchester,” 1989; 21(3):520.

Garland, P.V., “Color Code Identification of Small Arms Cartridges,” 1974; 6(2):27.

---. “Headstamp Designator +P,” 1974; 6(2):10.

Gieszl, R., “New Ammunition,” 1982; 14(1):40.

Green, K., “Remington Announces a New Headstamp for Rimfire,” 1983; 15(3):18.

Haag, L.C., “Korean Ammunition Available in North America,” 1981; 13(1):7.

---. “Stirling .22 Rimfire Ammunition,” 1977; 9(2):226.

Hall, J.M., “American Ballistics Grand Slam Cartridge,” 1991; 23(2):679-681.

Hamby, J.E., “Information on Delay Cartridges,” 1974; 6(1):5.

---. “Japanese Ammunition Information,” 1976; 8(2):19.

---. “New Headstamp on KTW Metal Piercing Cartridges,” 1971; 3(5):16.

---. “Tests on the Squibman .22 Caliber Cartridge,” 1971; 3(2):29.

---. “Two New Cartridges,” 1978; 10(3):47.

Hampton, H.L., “Letter From SAAMI: Headstamp Explanation,” 1974; 6(2):14.

Harden, L.R., “Geco Headstamp Information,” 1973; 5(3):10.

---. “Hi-Jacker Cartridge,” 1977; 9(1):39.

Heard, B.J., “Ammunition Information,” 1983; 15(1):65.

---. “New CBC Ammunition,” 1983; 15(2):16.
“Headstamps,” 1991; 23(3):874-875.

Heflin, T.F., “9MM Steyr Cartridge Conversions,” 1987; 19(3):262-265.

---.” Information on Various Cartridges,” 1985; 17(2):85.

Interpol, “Cartridge Identification,” 1976; 8(4):72.

---. “Cartridge Identification,” 1977; 9(1):69.

---. “Interpol: Cartridge Information,” 1976; 8(2):112.

Johnson, T.D., “Imported Ammunition,” 1979; 11(1):36.

Johnson, T.D., and Matty, W.G., “Starline Brass,” 1984; 16(4):60.

Kass, G.A., “Ammunition Information: Manufacturer & Headstamp,” 1983; 15(2):9.
---. “Headstamps,” 1990; 22(3):346-347.

---. “Headstamps,” 1991; 23(2):659.

Kellett, P.M., “Egyptian Headstamp,” 1990; 22(2):226.

---. “Toolmarks on the Case of Remington Semi-Jacketed Bullets,” 1984; 16(3):81.

Lambert, R.R., “Ammunition Headstamps,” 1972; 4(3):36.

Lomoro, V.J., “.22 Short, .22 Long Rifle and Now the .22 In-Between,” 1975; 7(2):33.

Lorsbach, L.A., “Dots Make a Difference,” 1976; 8(2):15.

Lutz, M.C., “Explosive Projectiles for Small Arms,” 1973; 5(1):12.

---. “Special .380 Submachine Gun Cartridge for MAC (Ingram) SMG,” 1972; 4(3A):35.

---. “Winchester & Hirtenberg Ammunition Sold by Sears Roebuck & Federal Cartridge Co.,” 1974; 6(4):14.

Matthews, J.W., “9X19 SP Headstamp,” 1980; 12(1):40.

Matty, W., “Wahib Arms Ammunition Information,” 1983; 15(1):68.

Moline, K., and Lansing, J., “Ammunition Information,” 1993; 25(3):204-205.

Molnar, S., “Observation While Firing HP Ammunition,” 1971; 3(5):6.

Nennstiel, R., “Collection of Headstamps and Projectiles,” 1985; 17(4):7.

Nicholson, T., “Headstamp Oddity,” 1970; 2(3):31.

Nielsen, F.I., “Unusual Head Stamps,” 1973; 5(5):27.

Poust, W.R., “Headstamp Impressions in Oily Residue,” 1987; 19(3):300.

---. “Observation of Different Headstamps in Same Box of Ammunition,” 1982; 14(2):12.

“Smith & Wesson Information,” 1979; 11(1):22.

Smith, A.G., “Cartridges Offered by Centennial Arms Corporation,” 1974; 6(3):16.

Smith, O.C., “Headstamps from Desert Storm,” 1993; 25(2):110-111.

Smith, R.J., “Star Ammunition,” 1975; 7(3):57.

Steidler, R.A., “Caliber .22 Ammunition With B Headstamp,” 1973; 5(1):27.

Stubits, F., “New Cartridge: The 22 Caliber Devastator,” 1981; 13(3):15.

Tokano, K., “Double Marked WW Headstamp,” 1989; 21(4):583.

Tulleners, F.A., “New Headstamp Cascade Cartridge International,” 1979; 11(2):87.

Waite, M.D., “Identification of Browning Arms Co Ammunition,” 1973; 5(3):26.

Woodin, W.H., “Military and Police Ammunition Research Identification,” 1981; 13(4):102.

Specific Models and Mechanism Marks

Carr, J.C., “AMT Automag II Identification by Dots,” 1990; 22(2):163-166.

---. “Lorcin L25 A Barrel With Class,” 1992; 24(1):17-21.

Celovsky, J.R., “Heckler & Koch, Model HK4 Pistol, Additional Outstanding Class Characteristics,” 1973; 5(5):23.

Celovsky, J.R., and Lemmer, J.T., “Heckler & Koch Pistol, Model VP702 9mm Parabellum,” 1984; 16(3):108.

Dujanovich, M.B., “Heckler & Koch 9x19mm Firearms,” 1995; 27(4):297-302.

---. “Navy Arms Model TU90 Semiautomatic Pistol,” 1994; 26(2):121-126.

Fournier, R.J., and Lemmer, J.T., “Type Sugiura: Oriental 32 ACP Pistol,” 1985; 17(2):38.

Garland, P.V., “SATA Semiautomatic Pistol,” 1970; 2(7):23.

Gieszl, R., “Bersa 380 Semiautomatic Pistols,” 1991; 23(3):862-866.

Kennington, R.H., “380 Auto Arcology: The Firing Pin Ejector Models,” 1996; 28(2):82-91.

---. “Ordinance Manufacturing Corporation Model Back-Up,” 1977; 9(1):42.

Kreiser, M.J., “Unusual Cartridge Marking by a Model 39 Smith & Wesson,” 1983; 15(4):13.

Lutz, M.C., “Central Kentucky Arms Semiautomatic Rifle,” 1983; 15(4):40.

Maciejewski, K., “Possible Identification Feature: .22 Caliber Smith & Wesson Model 61 Pistol,” 1970; 2(5):38.

Molnar, S., “Characteristics of the Erma .22 Caliber Luger Pistol,” 1970; 2(4):26.

Nichols, R.G., “Glock Versus Smith and Wesson Model SW40F: Comparison of Markings on Fired Cartridge Cases,” 1995; 27(2):133-139.

Reynolds, T.W., “Phoenix Arms (Model HP22),” 1995; 27(4):314.

Shem, R.J., and Striupaitis, P.P., “Fired Bullets & Cartridge Cases from Raven Pistol,” 1983; 15(3):109.

Sojat, J.G., and Hart, R.P., “Heckler & Koch Model HK-4 Pistol,” 1973; 5(2):19.

Stauffer, J.C., “Caliber .25 Sterling Auto Pistol,” 1972; 4(5):30.

Thompson, E., “Intratec Tec 22 Scorpion Pistol,” 1990; 22(1):51-54.

Firing Pin Impressions

Cochrane, D.W., “Firing Pin or Ejector?,” 1981; 13(4):106.

Fraser, D.A., “Rimfire Firing Pin Impressions,” 1983; 15(3):85.

Frazier, R.A., “Firing Pin Impressions: Their Relationship To Hammer Fall Conditions,” 1989; 21(2):589-92.

Haag, L.C., “Firing Pin Protrusion and Impression Depth Measurement,” 1990; 22(3):295-298.

Matty, W., and Johnson, T., “Comparison of Manufacturing Marks on Smith & Wesson Firing Pins,” 1984; 16(3):51.

McBrayer, W.S., “Unique Firing Pin Impression,” 1981; 13(4):116.

Miller, J., “Pressure Effects on Firing Pin Impression Depth,” 1995; 27(3):242-245.

Nielsen, F.I., “Ruger 10/22 Firing Pin Modification,” 1988; 20(3): 325.

Ojena, S.M., and Murdock, J.E., “Evaluation of an Alibi: Relative Firing Pin Impression Depths,” 1981; 13(3):79.

Stephenson, J.S., McPhillips, E.T., and Jachimowicz, E., “Use of a Duplex Nail as a Firing Pin in the Intratec Tec-9 Pistol,” 1996; 28(1):15-18.

Verbeke, D.J., and Stauffer, J.C., “Unique Firing Pin Identification,” 1975; 7(1):59.

Anvil Marks

Dutton, G., “Anvil Bounce,” 1996; 28(4):243-246.

Ernest, R.N., “Anvil Marks in Centerfire Cartridge Cases,” 1992; 24(4):367-370.

Gieszl, R., “Don’t Forget 22 Rimfire Anvil Marks,” 1991; 23(4):997-999.

Tuira, Y.J., and Ziegler, P.A., “Anvil Bounce,” 1995; 27(4):318-319.

Manufacturing Marks

Dutton, G., “Manufacturing Marks on 12 Gauge Cartridges,” 1997; 29(2):170-172.

Klees, G., “Aberrant Manufacturing Marks on Federal Ammunition,” 1997; 29(1):21-23.

LaVoy, T.A., and Willmer, J.H., “Toolmarkings From a Reloading Die,” 1979; 11(2):37.

Matty, W., “Persistence of Toolmarks in the Cartridge Case Head Forming Process,” 1983; 15(1):108.

Quirk, T.W., “Toolmarks on Primers of Rio’ Brand Ammunition,” 1987; 19(3):309-310.

Robinson, M.K., “Another Manufactured Toolmark,” 1996; 28(3):164-165.

Swim, J.D., “Firearms Examiners Beware,” 1979; 11(1):33-34.

Breech Face Marks

Cook, C.W., “Breech Face Markings from a Non Operable Weapon,” 1983; 15(4):53.

Esposito, A.J., “Apparent Mirror Image Breech Face Marking in the Stevens Model 311 Side by Side Shotgun,” 1995; 27(3):200-201.

Matty, W., “Raven 25 Automatic Pistol Breech Face Toolmarks,” 1984; 16(3):57.

Molnar, S., “False Breech Face ID’s,” 1996; 28(2):95-96.

---. “Marks of Spanner Wrench Holes in Firing Pin Escutcheons,” 1970; 2(7):34.

---. “Notes on Breech Face Marks and Fouling,” 1977; 9(1):21.

Thompson, E., “Davis Derringer Breech Face Markings,” 1996; 28(3):177-178.

Uchiyama, T., “Similarity Among Breech Face Marks Fired from Guns with Close Serial Numbers,” 1986; 18(3):15.

Wilson, R.J., “Mikrosil Breech Face Comparison,” 1983; 15(4):24.

Chamber Marks

Della Penna, A., “Chamber Markings?,” 1974; 6(2):22.

Dickinson, J.A.H., “Identification of Firearms by Chamber Marks on the Expended Cartridge Case,” 1976; 8(1):25.

Hamby, J.E., “Adapter Cartridges & Insert Barrels,” 1979; 11(4):23.

---. “Cartridge Adapters,” 1975; 7(3):16.

Hofmeister, A.G., “Revolver Chamber Markings,” 1979; 11(2):42.

Miller, J., “Chamber Marks from Dry-Fire Damage,” 1992; 24(2):162-164.

Shem, R.J., “Fireformed Chamber Striations on Rimfire Cartridge Cases,” 1987; 19(3):282-283.

Thompson, E., “Odd Chamber Markings in a 9mm Armi Tanfoglio Pistol,” 1992; 24(1):61-62.

Bunter Marks

Dodson, R.V., and Masson, J.J., “Bunter Marks: What Do They Mean,” 1997; 29(1):33-36.

Johnson, T.D., and Matty, W.G., “Starline Brass,” 1984; 16(4):60.

Matty, W., “Persistence of Toolmarks in the Cartridge Case Head Forming Process,” 1983; 15(1):108.

Zahn, M.S., “Unique Markings on a Shotshell Head Due to a Worn or Chipped Bunter Tool,” 1984; 16(3):8.

K. GUNSHOT RESIDUE EXAMINATIONS AND DISTANCE DETERMINATIONS

1. Successfully complete the Gunpowder and Primer Residues Course at the FBI Academy, Quantico, Virginia, or equivalent course. Coordinate this with your Training Officer.

   (*Use Training Assignment #41 to complete this objective*.)

   _____ _____
   Instructor Date

   _____ _____
   Training Officer Date

2. Demonstrate your proficiency in preparing the chemicals and the test papers used in the modified Griess test and the Sodium Rhodizonate test, including the test media and the photographic paper.

   (*Use Training Assignment #60 to complete this objective*.)

   _____ _____
   Training Officer Date

3. Describe in detail the chemical reactions that take place in the burning of smokeless powder, the modified Griess test and the Sodium Rhodizonate test.

   (*Use Training Assignment #60 to complete this objective*.)

   _____ _____
   Training Officer Date

4. Demonstrate your proficiency in conducting the following techniques, using the techniques set out in the Firearm Section protocol manual:

   a. conventional Modified Griess test
   b. reverse Griess test
   c. sodium rhodizonate test
   d. Bashinsky transfer
   e. blotting transfer

   _____ _____
   Training Officer Date

5. Using specimens provided to you by your Training Officer, demonstrate your proficiency in conducting "*muzzle-to-garment*" distance tests in cases involving the deposition of gunshot residues. Your examination should include note taking, microscopic and chemical examinations, test firing to produce test patterns and accurately determining "*muzzle-to-garment*" distance.

   _____ _____
   Training Officer Date

6. Using specimens provided to you by your Training Officer, demonstrate your proficiency in conducting "*muzzle-to-garment*" distance tests in cases involving shot patterns. Your examination should include note taking; microscopic; and chemical examinations; test firing of shot patterns; gunshot residue patterns; and accurately determining *"muzzle-to-garment*" distance; orientation of the firearm; sources and patterns of gunshot residues (e.g., muzzle orthogonal vs. muzzle oblique; GSR patterns from flash suppressors; sound suppressors; and revolver cylinder gap); and geometric aspects of powder and GSR patterns.

_____ _____
Training Officer Date

7. Read the article entitled "*Graphical Analysis of the Shotgun/Shotshell Performance Envelope in the Distance Determination Cases*" in the AFTE Journal, October 1989, issue. Discuss this article with your Training Officer.

_____ _____
Training Officer Date

8. Attend an autopsy of a shooting victim at the Medical Examiner's facilities. Document any indications of gunshot residue deposits photographically. Also, document the physical effects of the projectile on the body. Prepare a report on your observations and include any information obtained by medical examiner personnel concerning their opinions on distance determination and bullet effects, cause of death, direction of bullet travel and other information pertinent to firearm identification.

_____ _____
Medical Examiner Date

_____ _____
Training Officer Date

9. Visit the facilities of the Armed Forces Institute of Pathology *(AFIP if feasible or any other such facility in your area).* Become familiar with their mission, capabilities, casework and research efforts. Generate a report on your visit emphasizing your understanding of their capabilities concerning gunshot wound analysis.

_____ _____
Agency Representative Date

_____ _____
Training Officer Date

REFERENCE MATERIALS

TERMINAL BALLISTICS: GUNSHOT RESIDUES, SHOT TERMINAL BALLISTICS: GUNSHOT RESIDUES, SHOT PATTERNS, DISTANCE DETERMINATIONS, BULLET PATH ANALYSES AND WOUND EFFECTS ANALYSES AND WOUND EFFECTS

The following reference materials serve several purposes:

- to provide a wider range of additional resources should you have a particular interest in a given topic.
- to provide reference materials for your future professional use.
- to allow you to gain additional depth in particular subject areas.

Should you encounter other references in this category, you are encouraged to make additional notes about them at the end of this listing.

Books

Association of Firearm and Tool Mark Examiners Standardization Committee, Glossary of the Association of Firearm and Toolmark Examiners, 3rd Edition, Available Business Printing, Inc., Chicago, 1994.

Davis, T. L., The Chemistry of Powder and Explosives, reprinted by Angriff Press, Las Vegas, NV (Originally printed in two separate volumes in 1941 and 1943; also reprinted by John Wiley and Sons. New York 1950.) pp. 244-330, pp. 400-458.

Di Maio, V.J., Gunshot Wounds - Practical Aspects of Firearms, Ballistics, and Forensic Techniques, 2nd edition, CRC Press, Boca Raton, FL, 1998.

Fiegl, F., "Spot Tests in Organic Analysis," 7th edition, Elsevier Publishing Co., New York, 1966.

Fiegl, F., and Anger, V., "Spot Tests in Inorganic Analysis," 6th edition, Elsevier Publishing Co., New York, 1972.

Fisher, R.S., "Shotgun Wounds" in W.U. Spitz and R.S. Fisher, eds., Medicolegal Investigation of Death," Charles C. Thomas, Springfield, IL, 1980, pp. 275-294.

Kirk, Crime Investigation

Spitz, W.U., "Gunshot Wounds" in W.U. Spitz and R.S. Fisher, eds., Medicolegal Investigation of Death," Charles C. Thomas, Springfield, IL, 1980, pp. 216-274.

Wilson, Homicide Investigation Techniques

AFTE Journal

Gunshot Residues

Allen, D.E., "Effects of Blood on Gunshot and Gunpowder Residue," 1983; 15(2):102.

Bashinski, J.S., Davis, J.E., and Young, C., "Detection of Lead in Gunshot Residues on Targets Using the Sodium Rhodizonate Test," 1974; 6(4):5.

Bonfanti, M., and Gallusser, A., “Problems Encountered in the Detection of Gunshot Residues,” 1995; 27(2):105-122.

Branch, D.M., “Possible Griess Test Contamination,” 1982; 14(3):l 1.

Brown, C.G., “Detection of Nitrites and Lead in Gunpowder Residue Patterns,” 1985; 17(2):118.

Bydal, B.A., “Percussion Primer Mixes,” 1990; 22(l):1-26.

Campbell, P.A., “Antazoline Hydrochloride vs The Griess Test,” 1982; 14(2):87.

Carr, J.C., “Alternative Device for Distance Measurement in Range Determination Tests,” 1992; 24(l):76-78.

Cayton, J.C., “Blackpowder Firearms, Powder Residue & Ball Penetration,” 1984; 16(4):80.

Cochrane, D.W., “Test Pattern Cloth Range Determination Examination,” 1981; 13(2):55.

Cole, M.D., Ross N., and Thorpe, J.W., “Gunshot Residue and Bullet Wipe Detection Using a Single Lift Technique,” 1992; 24(3):254-259.

Cook, C.W., “Test Pattern Target Material for Proximity Testing,” 1979; 11(4):25.

---. “Halo Effect,” 1978:10(2):17.

Davis, J.E., “Some Notes on Bullet Holes and Powder Residues,” 1972; 4(4):17.

---. “Some Notes on Bullet Holes and Powder Residues,” 1989; 21(2):152-155.

---. “Target Materials for Powder Patterns,” 1977; 9(l):59.

Denio, D.J., “Forms To Document Procedure in Case Notes: Chemical Tests for Gunshot Residues,” 1997; 29(l):61-65.

Deobald, G., “Spiral Pattern,” 1995; 27(3):247.

Dillon, J.H., “Manufacture of Conventional Smokeless Powder,” 1991; 23(2):682-688.

---. “Modified Griess Test: A Chemically Specific Chromophoric Test for Nitrite Compounds in Gunshot Residues,” 1990; 22(3):243-250.

---. “Protocol for Gunshot Residue Examinations in Muzzle-to-Target Distance Determinations,” 1990; 22(3):257-274.

---. “Sodium Rhodizonate Test: A Chemically Specific Chromophoric Test for Lead in Gunshot Residues,” 1990; 22(3):251-256.

Dodson, R.V., and Stengel, R.F. “Recognizing Vaporized Lead from Gunshot Residue,” 1995; 27(l):43-44.

Doyle, J.S., “Griess Test Modification,” 1987; 19(2):165-168.

Dragan, P., and Brand, R., “Lead Deposits on Window Screen,” 1979; 11(2):43.

Gamboe, T.E., “Peculiar Feature in Near Contact Gunshot Residue Pattern,” 1993; 25(4):292-293.

Ghabbour, F.B., Walsh, M.I., and Abo-Namous, S.A., “Detection of Lead in Gunshot Residue: A Case Study,” 1990; 22(2):149-153.

Haag, L., “Gunshot Residue Testing of Bloody Garments,” 1994; 26(2):155-156.

Haag, L.C., “American Lead Free 9mm Parabellum Cartridges,” 1995; 27(2):142-149.

---. “Method for Improving the Griess and Sodium Rhodizonate Tests for GSR Patterns on Bloody Garments,” 1991; 23(3):808-815.

---. “Phenyltrihydroxyfluorone: A New Reagent for Use in Gunshot Residue Testing,” 1996; 28(I):25-31.

---. “Powder in a Most Peculiar Place,” 1990; 22(2):110-114.

---. “Propellant Type from the Examination of Fired Bullets,” 1980; 12(2):26.

---. “Microchemical Test for Copper Containing Bullet Wiping,” 1989; 13(3):22.

---. “Microchemical Test for Copper Containing Bullet Wiping,” 1989; 21(2): 298-303.

Haag, M.G., “2-Nitroso-1-Naphthol versus Dithiooxamide in Trace Copper Detection at Bullet Impact Sites,” 1997; 29(2):204-209.

Harden, L.R., “Gunpowder,” 1975; 7(I):63.

Harris, C.E., “Sherlock Holmes Would Be Impressed,” 1985; 17(I):16.

Horvath, M.A., “Gunshot Residue Patterns Using Infrared Microscopy,” 1981; 13(I):21.

Howe, W.J. “References Pertaining to Firearms Discharge Residues and Related Subject Matters,” 1972; 4(3A):26.

Hueske, E.E., “Gunshot Residue Testing of Blood Stained Garments,” 1994; 26(I):26-33.

Kreiser, M.J., “Lighting as a Consideration During Range Determinations on Skin,” 1983; 15(3):27.

---. “Potential False Reaction With the Griess Test,” 1984; 16(3):9.

Lambert, R.R., “Demonstrative Evidence,” 1970; 2(5):37.

---. “Powder Residue and Metallic Traces,” 1971; 3(3):30.

Lansing, J.F., and Powers, D.C., “Barrel Length vs Shot Powder Dispersion,” 1982; 14(I):29.

Lindman, D.A., “Weathering Time Factor in GSR Proximity Determinations,” 1989; 21(3):500-502.

Lindman, D.A., and Papke, R.E., “Range Determination by a Different Method,” 1991; 23(3):856-858.
Lutz, M.C., “Gunshot Residue Problems,” 1978; 10(l):4.

---. “Problems with Sodium Rhodizonate,” 1987; 19(l):15.

Lutz, M.C., and Templin, R.H., “Some Disinfectants Cause Positive Reaction to Griess Test,” 1983; 15(4):35.

Matty, W., “Primer Composition and Gunshot Residue,” 1987; 19(l):8-13.

---. “Unusual Source of Gunshot Residue Particles,” 1991; 23(l):535-537.

Molnar, S., “Bullet Bears Unusual Indications of Distance of Shot,” 1979; 11(4):21.

---. “ Powder Residues Can Give Valuable Clues to Examiner,” 1969; 1(4):37.

---. “Powder Residues Sometimes Reveal Barrel Length,” 1969; 1(4):39.

Murdock, J.E., “Collection of Gunshot Discharge Residues,” 1984; 16(3):136.

Nielsen, F.I., and Simpson, R., “Unusual Firearms Discharge Residues,” 1979; 11 (2):44.

Owens, M., and George, W., “Gunshot Residue Examinations: Modification in the Application of the Sequence of Chemical Tests,” 1991; 23(4):940-942.

Poole, R.A., “Nitrite Detection Kit,” 1978; 10(3):26.

---. “Revolver Cylinder Smoke Rings,” 1979; 11(2):61.

Rathman, G.A., “Gunpowder Gunshot Residue Deposition: Barrel Length vs Powder Type,” 1990; 22(3):318-327.

Shem, R.J., “Bleeding as a Source of Lead Particulates on Clothing,” 1994; 26(4):269-275.

---. “Vaporization of Bullet Lead by Impact,” 1993; 25(2):75-78.

Stone, I.C., “Evidence of Firearms Discharge Residues,” 1982; 14(4):25.

---. “Investigation into Examination and Analysis of Gunshot Residues,” 1984; 16(3):63.

Stone, I.C., and DiMaio, V.J.M., “Metallic Residues in Gunshot Wounds,” 1977, 9(2):31.

Stone, I.C. and Fletcher, L., “Primer Residue Study,” 1986; 18(2):49.

Stone, I.C., Fletcher, L., Jones, J., and Huang, G., “Investigation into Examinations and Analysis of Gunshot Residues,” 1989; 21(2):345-354.

Templin, R.H., “Unusual Powder Pattern Results,” 1988; 20(1):61-63.

Thompson, E., “Square Gunshot Residue Pattern,” 1997; 29(1):30-32.

Thompson, R.C., “Effects of Wind Velocity on Gunshot Powder and Residue,” 1997; 9(2):139.

Vandiver, J.V., “Toolmarks on Smokeless Powder: A Preliminary Inquiry,” 1976; 8(1):19.

Vaughan, R.T., and Gilman, P.L., “Barrel Length from Examination of a Contact Powder Pattern,” 1984; 16(3):16.

Veitch, G.M., “Examination of the Variables Encountered in Gun Shot Residue Patterns,” 1981; 13(2):35.

Watson, D.J., “Gunshot Residue vs. Fingerprint Powder,” 1984; 16(3):134.

“Nitrites Examination in Propellant Powder Residue,” 1979; 11(1):32.

Shot Patterning

Besant, P.E., Thompson, E.J., Hamby, J.E., Wolberg E., Haag, L., Martini, L.T., Loznycky, B., and Gailistel, T., “Rifled Shotgun Barrel Effect,” 1992; 24(3):246-253.

Boehm, A.P., “Bullet Holes/Shotgun Patterns in Metal Screens,” 1977; 9(2):181.

Dillon, J.H., “Graphical Analysis of the Shotgun/Shotshell Performance Envelope in Distance Determination Cases,” 1989; 21(4):593-594.

---. “Protocol for Shot Pattern Examinations in Muzzle-to-Target Distance Determinations,” 1991; 23(1):511-521.

Dunbar, D.A., “Identification of a Fired Sabot and a Distance Determination Involving a Shotshell Cartridge,” 1997; 29(1):26-29.

Garrison, D.H., “Field Recording and Reconstruction of Angled Shot Pellet Patterns,” 1995; 27(3):204-208.

Kamaka, S.K., “Sawed Off Shotgun and Shot Pattern,” 1970; 2(7):26.

Kapelsohn, E., “Shotgun Patterns, Chokes and Performances,” 1988; 20(4):421-434.

Kley, E.P., and Rowe, W.F., “Trajectories of 00 Buckshot,” 1989; 21(2):457-460.

---. “Trajectories of 00 Buckshot,” 1988; 20(4):404-407.

Lutz, M.C., “Pellet Counting Device & Shot Measuring Device,” 1983; 15(3):24.

Mann, M.J., Espinza, E.O., Ralston, R.M., Stroud, R.K., Scanlan, M.D., and Strauss, S.J., “Shot Pellets: An Overview,” 1994; 26(3):223-241.

Mann, M.J., Ferguson, W., Henderson, C., and Stroud, R., “Analysis of Unusual Home Made Shot Pellets From Louisiana,” 1994; 26(3):242-250.

Matunas, E., “All About Shot,” 1988; 20(3):280-289.

Molnar, S., and Nicholson, T.V., “Shot Pattern With 00-Buck,” 1977; 9(2):132.

Omilion, P.M., “Effects of Window Glass on Shotgun Pellets Pattern,” 1979; 11(4):54.

Silliman, J.R., “Crime Scene Search: Evidence at the Scene of a Shotgun Shooting,” 1977; 9(2):111.
Thornton, J.I., and Guarino, K., “Polyethylene Shotshell Buffer & Determination of Trajectory,” 1984; 16(3):132.

Vincie, P., and Thornton, J.,”Quality Assurance in Shotshell Manufacture Implications for Determination of Discharge Distance,” 1985; 17(3):70.

Watkins, R.L., and Haag, L.C., “Shotgun Evidence,” 1978; 10(3):10.

Wound Effects

“International Wound Ballistics Association and the Wound Ballistics Review,” 1991; 23(2):654.

“Terminal Ballistics Results,” 1975; 7(2):110.

Bell, E.A., “Wound Characteristics,” 1975; 7(3):74.

Di Maio, V.J.M., “Wound Ballistics,” 1972;4(5):27.

Dougherty, P.J., “Early Investigations into the Mechanisms of Wounding,” 1984; 16(4):46.

Fackler, M.L., “Bullet Penetration: Modeling the Dynamics and Incapacitation Resulting from Wound Trauma, by Duncan MacPherson,” 1995; 27(2):150-151.

---. “Handgun Bullet Performance,” 1988; 20(4):446-448.

---. “Ordinance Gelatin Ballistic Studies,” 1987; 19(4):403-405.

---. “Tissue Disruption Pattern Used to Determine the Direction of Fire in an Unusual Bullet Wound,” 1995; 27(3):250-253.

---. “Wound Ballistics,” 1989: 21(1):25.

---. “Wounding Patterns of Military Rifle Bullets,” 1989; 21(4):643-649.

Jason, A., Fackler, M., Dougherty, P., and Malinowski, J., “Omnishock Bullets,” 1989; 21(1):32.

Gag, J., “Survey of Handgun Cartridges for Law Enforcement Applications,” 1982; 14(2):110.

Gerns, J.S., “Wounding Effects of Unconventional Ammunition,” 1984; 16(2):103.

Haag, L.C., “Ballistic Gelatin: Controlling Variances in Preparation and a Suggested Method for the Calibration of Gelatin Blocks,” 1989; 21(3):483-489.

Hall, J.M., “Unusual Bullet Wound,” 1992; 24(1):55-57.

Hanson, S.R., “Physical Evidence Collection for Medical Personnel,” 1985; 17(1):69.

Jones, J.A., “Evaluation of Police Ammunition: .38 Special, .45 ACP and 9mm Parabellum,” 1974;6(1):11.

Lattig, K.N., “Sizing Shotgun Slug Entrance Wounds,” 1987; 19(4):433-437.

---. “Sizing Shotgun Slug Entrance Wounds,” 1989; 21(2):429-433.

Minnigerode, S.C., “Missile Wounds: Entrance and Exit Gunshot Wounds,” 1977; 9(2):157.

Poole, R.A., Cooper, R.E., Emanuel, L.G., Fletcher, L.A., and Stone, I.C., “Angle Effect on Hollow Point Bullets Fired into Gelatin,” 1994; 26(3):193-198.

Reich, J.E., “Cooperation Between the Firearms Examiner and Medical Examiner,” 1983; 15(1):30.

---. “Five Gunshot Wounds Caused by a Single Shot,” 1979; 11(2):34.

Robert, G.K. and Bullian, M.E., “Comparison of the Wound Ballistic Potential of 9mm vs 5.56(.223) Cartridges for Law Enforcement Entry Applications,” 1993; 25(2):142-148.

Roberts, G.K., and Wolberg, E.J., “Book Review: Handgun Stopping Power: The Definitive Study,” 1992; 24(4):383-387.

Smith, W.C., “Notes on Terminal Ballistic Effects, Using Caliber.30 Military Ammunition,” 1970; 2(5):20.

Thorpe, J.C., “Penetration Tests of Two 38 Special +P Ammunitions,” 1985; 17(2):83.

---. “Penetration Tests of Societe Francaise Munitions (SFM) T.H.V. 9mm & 357 Magnum,” 1987; 19(2):151-164.

Tuira, Y.J., “Classic Contact Wound,” 1981; 13(2):21.

Voorhees, R.S., “One Bullet Wound Two Bullets,” 1979; 11(3):60.
Wecht, C.H., and Perper, J.A., “Forensic Examination of Gunshot Wound Fatalities,” 1980; 12(1):11.

Wilson, R.J., “Identification of an Unknown Firearm from Contact Wound Characteristics,” 1996; 28(3):154-163.

---. “Technique for Recording Gunshot Wounds: Plastic Overlay,” 1984; 16(3):74.

Shooting Reconstruction

Cook, C.W., “Ballistics and the Firearm Examiner,” 1978; 10(2):49.

---. “Bullet Hole Size Determination,” 1983; 15(4):38.

Courtney, M., and Hueske, E.E., “Use of Hand Held Laser Pointers in the Reconstruction of Events at Crime Scene,” 1994; 26(3):170-172.

Davis, W.C., “Baltecl Computer Program Update,” 1990; 22(1):40-50.

French, M.L., “Impact Angle Determination through Plastic Windows,” 1997; 29(I):73-79.

French, M.L., and Thompson, E.J., “Scene Reconstruction Using a Ballistic Alignment Laser,” 1997; 29(3):372-374.

Garrison, D.H., “Effective Use of Bullet Hole Probes in Crime Scene Reconstruction,” 1996; 28(1):57-63.

---. “ Examining Auto Body Penetration in the Reconstruction of Vehicle Shootings,” 1995; 27(3):209-212.

---. “Reconstructing Bullet Paths With Unfixed Intermediate Targets,” 1995; 27(1):45-48.

---. “Reconstructing Drive-By Shootings from Ejected Cartridge Case Location,” 1993; 25(1):15.

---. “Recording Bullet Defects at Crime Scenes,” 1996; 28(3):168-172.

---. “Shooting Reconstruction vs Shooting Reenactment,” 1993; 25(2):125-127.

Haag, L.C., “Bullet Impact Spalls in Frangible Surfaces,” 1980; 12(4):71.

---. “Bullet Ricochet: An Empirical Study and a Device for Measuring Ricochet Angle,” 1975; 7(3):44.

---. “Bullet Ricochet: An Empirical Study and a Device for Measuring Ricochet Angle,” 1989; 21(2):182-188.

---. “Bullet Ricochet From Water,” 1979; 11(3):27.

---. “Construction of an Inexpensive Portable Laser For Use in Shooting Reconstructions,” 1987; 19(2):175-177.

---. “Forensic Use of Exterior Ballistic Calculations,” 1979; 11(1):13.

---. “Hornady Vector Ammunition: A New Tool in Studying Selected Exterior and Terminal Ballistic Events of Forensic Interest,” 1996; 28(1):32-40.

---. “Measurement of Bullet Deflection by Intervening Objects and the Study of Bullet Behavior After Impact,” 1987; 19(4):382-387.

---. “Portable Laser Theodolite System for Use in Shooting Scene Reconstruction,” 1991; 23(1):538-542.

---. “Use of Ballistic Calculations in the Solution of a Crime,” 1976; 8(4):45.

---. “Use of Ballistic Calculations in the Solution of a Crime,” 1989; 21(2):190-195.

---. “Vertical Ballistics,” 1990; 22(1):27-33.

Houde, J., and Cassidy, F.H., “Short-Range Bullet Trajectory Computer Program for MS-DOS Computers,” 1991; 23(3):784-791.

Hueske, E.E., “Calculation of Trajectory Angles Using an Inexpensive Angle Gauge,” 1993; 25(3):231-233.

Lattig, K.N., “Determination of the Point of Origin of Shots Fired into a Moving Vehicle,” 1991; 23(1):524-534.

Laskowski, G.E., “Use of the LaserMax Gunsight as a Ballistics Alignment Tool,” 1997; 29(3):369-371, 329.

Molnar, S., “Bullets, Bullet Holes, Strings, Line of Sight,” 1969; 1(4):6.

---. “Use of Scale Drawings to Establish Facts in Shooting Cases,” 1970; 2(2):2-14.

Nennstiel, R., “Accuracy in Determining Long-Range Position of Gunman,” 1985; 17(1):47.

---. “Determination of the Line of Sight Angle Through Firing Experiments,” 1991; 23(4):919-924.

---. “E.B. Version 4.0 Now Available,” 1995; 27(1):35-37.

---. “E.B. Version 2.0 Upgrade Now Available,” 1991; 23(1):505.

---. “Exterior Ballistics (EB), The Computer Program Revised,” 1990; 22(3):341-342.

---. “Forensic Aspects of Bullet Penetration of Thin Metal Sheets,” 1986; 18(2):18.

---. “How do Bullets Fly?” 1996; 28(2):104-143.

---. “Software Review,” 1990; 22(2):217-219.

---. “Study of Bullet Ricochet on a Water Surface,” 1984; 16(3):88.

Nicolosi, F.M., “Ballistics Alignment Laser,” 1992; 24(1):65-68.

Patty, J.R., “Associating Recovered Bullets with Ricochet Sites,” 1975; 7(2):28.

Prendergast, J.M., “Determination of Bullet Impact Postion From the Examination of Fractured Automobile Safety Glass,” 1994; 26(2):107-118.

Rathman, G.A., “Bullet Impact Damage and Trajectory Through Auto Glass,” 1993; 25(2):79-86.

---. “Bullet Ricochet and Associated Phenomena,” 1987; 19(4):374-381.

Roberts, J.L., and Hamby, J.E., “Reconstruction of a Shooting to Prove/Disprove a Trajectory,” 1985; 17(2):53.

Stone, R.S., “Calculation of Trajectory Angles Using a Line Level,” 1993; 25(1):21.

Thornton, J.I., “Effect of Tempered Glass on Bullet Trajectory,” 1983; 15(3):29

Trahin, J.L., “Bullet Trajectory Analysis,” 1987; 19(2):124-150.

Vaughan, R.T. and Dunklau, P., “Bullet Penetration Through Plastic,” 1992; 24(4):356- 357.

Warren, G., “Simple Measurement of Angles of Elevation,” 1991; 23(3):869.

Zeldes, I., “Laser Beam: A New Tool for Firearm Examiner,” 1981; 13(4):21.

Journals

“Ball Powder” (with four page flow chart), Chemical Engineering,Dec. 1946, pp. 136-139.

Barnes, F.C., and Helson, R.A., “An Empirical Study of Gunpowder Residue Patterns,” Journal of Forensic Sciences, Vol. 19, 1974, pp. 448-462.

Breitenecker, R., and Senior, W., “Shotgun Patterns I - An Experimental Study on the Influence of Intermediate Targets,” Journal of Forensic Sciences, Vol. 12,1967, pp. 193-204.

Fann, C.H., Ritter, W.A., Watts, R.H., and Rowe, W.F., “Regression Analysis Applied to Shotgun Range-of-Fire Estimates: Results of a Blind Study,” Journal of Forensic Sciences, Vol. 31, 1986, pp. 840-854.

Jauhari, M., Chatterjea, S.M., and Ghosh, P.K., “Statistical Treatment of Pellet Dispersion Data for Estimating Range of Firing,” Journal of Forensic Sciences, Vol. 17,1972. pp.141-149.

Moreau, T.S., Nickels, M.L., Wray, J.L., Bottemiller, K.W., and Rowe, W.F., “Pellet Patterns Fired by Sawed-Off Shotguns,” Journal of Forensic Sciences, Vol. 30,1985, pp. 137-149.

Rowe, W.F., and Hanson, S.R., “Range of Fire Estimates from Regression Analysis Applied to the Spreads of Shotgun Pellet Patterns: Results of the Blind Study,” Forensic Science Int., Vol. 28,1985, pp. 239-250.

Walker, J.T., “Bullet Holes and Chemical Residues in Shooting Cases,” Journal of American Institute of Criminal Law and Criminology, Vol. 31, 1940, pp. 497-521.

Wray, J.L., McNeil, J.E., and Rowe, W.F., “Comparison of Methods for Estimating Range of Fire Based on the Spread of Buckshot Patterns,” Journal of Forensic Sciences, Vol. 28, 1983, pp. 846-857.

Zeichner, A., and Glattstien, B., “Improved Reagents for Firing Distance Determination, “Journal of Energetic Materials, Vol. 4, 1986, pp. 187-197.

Periodicals

Brown, P., “What is This Ball Powder?” (with charts), The American Rifleman, Dec. 1952, p. 17.

“Computerized Ballistics,” Gun Tests, Feb. 1994.

“Computerized Ballistics II, More High-Tech Data,” Gun Tests, Feb. 1996.

"Gunpowder and Gunshot Residue" FBI Manual

"Winchester Super Unleaded Ammo," Law Enforcement Technology, Jul. 1995, pp. 56 and 58-60.

Wooters, J., "Winchester-Western's New Ball Powder Line," The Handloader Magazine, Sep.-Oct. 1973, p. 36.

Papers

Ballou, S., "Reconstruction of Trajectory Paths Through the Use of Basic Trigonometric Functions," paper presented at the FBI Laboratory Crime Scene Processing and Reconstruction Seminar, September 4-6, 1996, Quantico, VA.

Bashinski, J.S., Davis, J.E., and Young, C., "Detection of Gunshot Residues - the Sodium Rhodizonate Test." Presented at the 1974 spring meeting of the California Association of Criminalists, Long Beach, CA.

Bashinski, J.S., "The Evaluation of Gunshot Residues - the Sodium Rhodizonate Test." Presented at the 1974 fall meeting of the California Association of Criminalists, Berkeley, CA.

Ernest, R., "A Study of Shooting Scene Dynamics," paper presented at the FBI Laboratory Crime Scene Processing and Reconstruction Seminar, September 4-6, 1996, Quantico, VA.

Taormina, S., "Reconstructive Placement of a Victim Within the Kill Site of a Homicidal Shotgun Discharge, paper presented at the FBI Laboratory Crime Scene Processing and Reconstruction Seminar, September 4-6, 1996, Quantico, VA.

L. TOOLMARK EXAMINATIONS AND COMPARISONS

1. Review your notes in reference to the section entitled "*Manufacture of Modern Firearms*." Those machining methods are the basis for toolmark identification as they were for firearm identification. However, it should be noted that in the broad definition of toolmarks identification, certain other related types of examinations are also performed. Discuss your review with your Training Officer.

   (*Use Training Assignment #64 to complete this objective*.)

   _____ _____
   Training Officer Date

2. Define the word *"tool*" and "*toolmarks identification*" in the narrow sense of the expression. Also define toolmark identification in its broadest sense, and determine the kinds of conclusions that may be reached in toolmark identification. Set these out in detail and discuss these with your Training Officer.

   (*Use Training Assignment #64 to complete this objective*.)

   _____ _____
   Training Officer Date

3. Discuss the significance of examining submitted tools first for trace evidence and itemize several types of such deposits.

   (*Use Training Assignment #64 to complete this objective*.)

   _____ _____
   Training Officer Date

4. In a case involving a toolmark examination wherein no tool is submitted, determine the types of conclusions which can be reached. Consider such things as the type of tool, size of the tool, action employed by tool, value of toolmark for comparison purposes, and unusual tool features. Discuss the "*no tool*" case with your Training Officer.

   (*Use Training Assignment #64 to complete this objective*.)

   _____ _____
   Training Officer Date

5. Define the following terms as they relate to toolmark identification and give three examples of tools or methods that could produce each category:

   a. Shearing
   b. Pinching
   c. Fracture
   d. Scrape mark
   e. Impression
   f. Slicing

   (*Use Training Assignment #65 to complete this objective*.)

   _____ _____
   Training Officer Date

6. Define the term "*class characteristics*" as it applies to toolmark identification. Using the tools or methods selected as examples in the above, describe their respective class characteristics in detail.

   Select at least two tools representative of each category listed in paragraph 5, above. Produce toolmarks with each tool and observe the class characteristics of the toolmark. Vary the angle and force with which each tool is used.

   (*Use Training Assignment #65 to complete this objective*.)

   _____ _____
   Training Officer Date

7. Using soft copper wire of approximately 1/4-inch diameter, make cuts through it with the tools that employ a shearing, pinching and slicing action. Make test cuts in lead using the same tools. Attempt to identify the cuts in the copper wire as having been made by the same tool as that which cut the test lead. Support your results with photographs and note any lighting considerations made necessary by the color difference between copper and lead.

   _____ _____
   Training Officer Date

8. Select a flat-bladed tool such as a screwdriver, and a pry bar and make marks in a piece of copper or brass sheeting. Make the same type of marks in lead with both tools. Microscopically compare those in the brass or copper sheeting with the test marks in the lead. Attempt to identify the appropriate marks with the appropriate tool. Photograph your results and comment on the difference in the quality of marks made by each tool.

   _____ _____
   Training Officer Date

9. Using a drive pin punch, produce an impression in a piece of brass sheeting. Produce a set of test marks in lead and examine these two marks. Attempt to identify these as having been made by the same tool. Support your results by photographs.

_____ _____
Training Officer Date

10. Using a junked doorknob and a serrated-jawed tool, have your Training Officer produce impressions and scrape marks like those produced by an attempt at an entry. Devise a method of obtaining test marks in lead like those produced by the serrated-jawed tool on the doorknob. Microscopically examine the marks on the doorknob with those on the test material. Identify the tool with the marks on the doorknob and reproduce the tool-doorknob orientation and relate each mark to its respective serration on the tool.

_____ _____
Training Officer Date

11. Learn the technique of reverse lighting. Obtain a piece of brittle material such as Plexiglass or pot metal and fracture it into two fragments. Attempt to identify the two fragments as having once been a single object. Take notes and support your results by photographs.

_____ _____
Training Officer Date

12. Obtain an ax blade that contains numerous defects. Cut a piece of seasoned wood such as dowel rod with the ax blade and attempt to identify the blade with the cut. Insure that your test cuts are consistent with your "*unknown*" with respect to the orientation of the ax to the wood and the direction of the grain. Support your results with sketches and photographs.

_____ _____
Training Officer Date

13. Obtain a section of large-diameter telephone cable and cut it with the ax used above and study the effects of a slicing action on a multi-stranded cable. Note the quality and extent of microscopic marks of each strand and comment on the problems involved in identifications of this sort. Photograph the sliced end of the cable.

_____ _____
Training Officer Date

14. Discuss the fact that generally saws, files and abrasive tools are not identifiable with the marks they produce. Cite any exceptions to this rule.

_____ _____
Training Officer Date

15. Obtain a used tire and make cuts and stabs into the sidewall with a fixed blade knife. Attempt to make comparisons of the toolmarks produced by the knife. Support your results with photographs and notes. Discuss how the results of your examinations might be altered if the knife had been sharpened after making the questioned cuts, or if the knife had been used for an extended period of time after making the initial questioned cuts.

_____ _____
Training Officer Date

16. Investigate pressure/contact examinations in regard to objects that may have been in contact with each other for an extended time. Research several cases of this type and set these out in your notes.

(*Use Training Assignment #64 to complete this objective*.)

_____ _____
Training Officer Date

17. Discuss and demonstrate the making of casts of toolmarks. Also, discuss the potential of such casts and of photographs alone in making toolmarks identifications.

(*Use Training Assignment #64 to complete this objective*.)

_____ _____
Training Officer Date

REFERENCE MATERIALS
TOOLMARK EXAMINATIONS, COMPARISONS AND IDENTIFICATIONS

The following reference materials serve several purposes:

- to provide a wider range of additional resources should you have a particular interest in a given topic.
- to provide reference materials for your future professional use.
- to allow you to gain additional depth in particular subject areas.

Should you encounter other references in this category, you are encouraged to make additional notes about them at the end of this listing.

Criteria for the Identification of Toolmarks
(Including Those Found on Fired Ammunition Components)

AFTE Peer Group on Certification, "Firearms and Tool Mark Identification: A Forensic Science Discipline," AFTE Journal, 1980; 12(3):12-15.

Association of Firearm and Tool Mark Examiners, "Theory of Identification," AFTE Glossary, Revision Section, Toolmarks Section, Appendix E (Knives), and Appendix H (Machining Terms).

Belveal, D.N., "Firearms Identification Based Upon Bullet Comparisons: Expertise or Guesswork," California Attorneys for Criminal Justice Forum, Vol. 4, No. 2, Mar.-Apr. 1977, p. 17.

Biasotti, A.A., "Bullet Comparisons A Study of Fired Bullets Statistically Analyzed," unpublished Master's thesis, School of Criminology, University of California, Berkeley, 1955, 97 pages.

---. "A Statistical Study of the Individual Characteristics of Fired Bullets," Journal of Forensic Sciences, Vol. 4, No. 1, Jan. 1959, pp. 34-50.

---. "The Principles of Evidence Evaluation as Applied to Firearms and Tool Mark Identification," Journal of Forensic Sciences, Vol. 9, No. 4, Oct. 1964, pp. 428-433.

---. "Firearms and Toolmark Identification: A Forensic Science Discipline, AFTE Journal, 1980; 12(3):12.

---. "Characteristics in Firearms and Toolmark Identification," AFTE Journal, 1980; 12(4):81.

---. "Rifling Methods - A Review and Assessment of the Individual Characteristics Produced, " AFTE Journal, 1981; 13(3):34.

---. "Methods Applied to the Comparison of Class and Individual Characteristics in Firearms and Toolmark Identification," AFTE Journal, 1989; 21(2):260-263.

Biasotti, A.A., and Murdock, J.E., "Criteria for Identification or State of the Art of Firearms and Toolmark Identification," AFTE Journal, 1984; 16(4):16-22.

---. “Firearms and Toolmark Identification,” Modern Scientific Evidence: The Law and Science of Expert Testimony, Vol. 2, West Publishing, St. Paul, MN, 1997, pp. 124-155.

Blackwell, R., and Framan, E., “Automated Firearms Identification System (AFIDS): Phase I, AFTE Journal, 1980; 12(4):11-37.

Bonfanti, M., and DeKinder, J., “The Influence of Manufacturing Processes on the Identification of Bullets and Cartridge Cases A Review of the Literature,” Science and Justice, Vol. 39, No. 1, 1999, pp. 3-10.

Boyd, K.T., “Use of Probability Theory in Making Identifications Through Common Characteristics,” paper presented at AFTE meeting in Washington, D.C., Feb. 1974.

Brackett, J., “A Study of Idealized Striated Marks and Their Comparison Using Models,” Journal of the Forensic Science Society, Vol. 10, No. 1, 1970, pp. 27-56.

Brown, C., and Bryant, W., “Consecutively Rifled Gun Barrels Present in Most Crime Labs,” AFTE Journal, 1995, 27(3):254-258.

Brundage, D.J., “The Identification of Consecutively Rifled Gun Barrels,” AFTE Journal, 1998; 30(3):438.

Burd, D.Q., and Gilmore, A., “Individual and Class Characteristics of Tools,” Journal of Forensic Sciences, Vol. 13, No. 3, Jul. 1968, pp. 390-396.

Burd, D.Q., and Greene, R.S., “Tool Mark Comparisons in Criminal Investigations,” Journal of Criminal Law, Criminology and Police Science, Vol. 39, 1948, pp. 379-391.

---. “Tool Mark Examination Techniques,” Journal of Forensic Sciences, Vol. 2, 1957, pp. 297-310.

Burd, D.Q., and Kirk, P.L., “Toolmarks: Factors Involved in Their Comparison and Use as Evidence,” Journal of Police Science, Vol. 32, No. 6, 1942, pp. 679-686.

Butcher, S., and Pugh, D., “A Study of Marks Made by Bolt Cutters,” Journal of the Forensic Science Society, Vol. 15, No. 2, Apr. 1975, pp. 115-126.

Cassidy, F.H., “Examination of Toolmarks from Sequentially Manufactured Tongue and Groove Pliers,” Journal of Forensic Sciences, Vol. 25, No. 4, Oct. 1980, pp. 796-809.

Churchman, J., “The Reproduction of Characteristics in Signatures of Cooey Rifles,” RCMP Gazette, Vol. 11, No. 5, May 1949, pp. 133-140.

Collins, J., “The Language of Toolmarks,” AFTE Journal, 1998; 30(1):82.

---. “Wire Nails and Their Forensic Significance,” AFTE Journal, 1998; 30(4):614.

Conrad, E.C., “The Expert and Legal Certainty,” Journal of Forensic Sciences, Vol. 9, No. 4, Oct. 1964, pp. 445-455.

DeKinder, J., Prevot, P., Perlot, M., and Nys, B., “Surface Topology of Bullet Striations: An Innovative Technique,” AFTE Journal, 1998; 30(2):294.

Deschenes, M., et al., “Statistics and Toolmark Comparisons,” AFTE Journal, 1995; 27(2):140-141.

Deinet, W., “Studies of Models of Striated Marks Generated by Random Processes,” Journal of Forensic Sciences, Vol. 26, No. 1, Jan. 1981, pp. 35-50.

Dougherty, P.M., “Report on Two Early United States Firearms Identification Cases,” Journal of Forensic Sciences, Vol. 14, No. 4, Oct. 1969, pp. 453-459.

Flynn, E.M., “Toolmark Identification,” Journal of Forensic Sciences, Vol. 2, Jan. 1957, pp. 95-106.

Fox, R.J., “The Myth of Bullet Matching,” Forensic Science, Civil and Criminal Symposium conducted in Eugene, Oregon, November 1987.

Freeman, R., “Consecutively Rifled Polygon Barrels,” AFTE Journal, 1978; 10(2):40-42.

Goddard, C.H., “Scientific Identification of Firearms and Bullets,” AFTE Journal, 1979; 11(4):97.

Greene, R.S., and Burd, D.Q., “Special Techniques Useful in Tool Mark Comparisons,” Journal of Criminal Law, Criminology and Police Science, Vol. 41, 1950, pp. 523-527.

Grzybowski, R.A., Summary of Proficiency Testing Results in the Firearms and Toolmark Field extracted from Peterson, J.L., and Markham, P.N., “Crime Laboratory Proficiency Testing Results, 1970-1991, II: Resolving Questions of Common Origin,” Journal of Forensic Sciences, Vol. 40, No. 6, Nov. 1995, pp. 1009-1029.

Gunther, C.O., “Markings on Bullets and Shells Fired from Small Arms,” Mechanical Engineering, May 1932, pp. 341-345.

Hall, E., “Bullet Markings from Consecutively Rifled Shilen DGA Barrels,” AFTE Journal, 1983; 15(1):33-47.

Hall, J., “Consecutive Cuts by Bolt Cutters and Their Effect on Identification,” AFTE Journal, 1992; 24(3):260-272.

Hornsby, B., “MCC Bolt Cutters,” AFTE Journal, 1989; 21(3):508.

Kingston, C.R. “The Law of Probabilities and the Credibility of Witnesses and Evidence,” Journal of Forensic Sciences, Vol. 15, No. 1, Jan. 1970, pp. 18-27.

Kirby, S.J., “Comparison of 900 Consecutively Fired Bullets and Cartridge Cases from a 455 Caliber S&W Revolver,” AFTE Journal, 1983; 15(3):113-126.

Kirk, P.L., and Kingston, C.R., “Evidence Evaluation and Problems in General Criminalistics,” Journal of Forensic Sciences, Vol. 9, No. 4, Oct. 1964, pp. 434-444.

Kockel, R., “About the Appearance of Clues or Marks from Knife Blades,” AFTE Journal, 1980; 12(3):16.

Kreiser, J., “Identification of Cast Bullets and Their Molds,” AFTE Journal, 1985; 17(3):88-90.

Lardizibal, P., “Cartridge Case Study of the Heckler and Koch USP,” AFTE Journal, 1995; 27(1):49-51.

Lopez, L., “Striae Matching and Angle of Incident,” AFTE Journal, 1998; 30(2):271.

Lutz, M.C., “Consecutive Revolver Barrels,” AFTE Newsletter, Aug. 1970, pp. 24-28.

Masson, J.J., “Confidence Level Variations in Firearms: Identifications Through Computerized Technology,” AFTE Journal, 1997; 29(1):42-44.

Matty, W., “Comparison of Three Individual Barrels Produced from One Button Rifled Barrel Blank” AFTE Journal, 1985; 17(3):64-69.

---. “Raven 25 Automatic Pistol Breech Face Toolmarks,” AFTE Journal, 1984; 16(3):57.

Matty, W., and Johnson, T., “Comparison of Manufacturing Marks on Smith & Wesson Firing Pins,” AFTE Journal, 1984; 16(3):51.

May, L.S., “The Identification of Knives, Tools and Instruments, A Positive Science,” American Journal of Police Science, Vol. 24, No. 6, 1936, p. 246.

Meyers, C.R., “Objective vs. Subjective Boondoggle,” AFTE Journal, 1987; 19(1):24-30.

Miller, J., “Cut Nail Manufacturing and Tool Mark Identification,” AFTE Journal, 1998; 30(3):492.

---. “Reproducibility of Impressed and Striated Toolmarks: 4d Cut Flooring Nails,” AFTE Journal, 1998; 30(4):631.

Miller, J., and McLean, M., “Criteria for Identification of Toolmarks,” AFTE Journal, 1998; 30(1):15-61.

Murdock, J.E., “Effect of Crowning on Gun Barrel Individuality,” AFTE Journal, 1970; 2(3):12.

---. “Individuality of Toolmarks Produced by Desk Staplers,” AFTE Journal, 1974; 6(5-6):23.

---. “A General Discussion of Gun Barrel Individuality and an Empirical Assessment of the Individuality of Consecutively Button Rifled .22 Caliber Rifle Barrels,” AFTE Journal, 1981; 13(3):84-111.

---. “Some Suggested Court Questions to Test Criteria for Identification Qualifications,” AFTE Journal, 1992; 24(1):69-75.

Nichols, R.G., “Firearm and Toolmark Identification Criteria: A Review of the Literature,” Journal of Forensic Sciences, Vol. 42, No. 3, 1997, pp. 466-474.

Ogihara, Y., Kubota, M., Sanada, M., Fukuda, K., Uchiyama, T., and Hamby, J.E., “Comparison of 5000 Consecutively Fired Bullets and Cartridge Cases from a 45 Caliber M1911A1 Pistol,” AFTE Journal, 1983; 15(3):127-140.

Reitz, J., “An Unusual Toolmark Identification Case,” AFTE Journal, 1975; 7(3):40-43.

Rowe, W.F., “Statistics in Forensic Ballistics,” The Use of Statistics in Forensic Science, C.G.G. Aitken and D.A. Stoney, Elllis Hammond, 1991.

Serhant, J.E., “The Admissibility of Ballistics in Evidence,” American Journal of Police Science, May-Jun. 1930.

Skolrood, R., “Comparison of Bullets Fired from Consecutively Rifled Cooey Rifles,” Canadian Society of Forensic Science Journal, Vol. 8, No. 2, 1975, pp. 49-52.

Springer, E., “Toolmark Examinations A Review of Its Development in the Literature,” Journal of Forensic Sciences, Vol. 40, No. 6, Nov. 1955, pp. 964-968.

Stoney, D.A., “What Ever Made Us Think We Could Individualize Using Statistics,” Journal of the Forensic Science Society, Vol. 31, No. 2, 1991, pp. 197-199.
Taroni, F., Champod, C., and Margot, P., “Statistics, A Future in Toolmarks Comparisons?,” AFTE Journal, 1996:28(4):222-232.

"Theory of Identification, Range of Striae Comparison Reports and Modified Glossary Definitions - An AFTE Criteria for Identification Committee Report," AFTE Journal, 1992, 24(3):336-340.

Thomas, F., "Comments on the Discovery of Striation Matching and on Early Contributions to Forensic Firearms Identification," Journal of Forensic Sciences, Vol. 12, No. 1, Jan. 1967, pp. 1-7.

Thompson, E., "Individual Characteristics Criteria," AFTE Journal, 1998; 30(2):276.

---. "Phoenix Arms (Raven) Breech Face Toolmarks," AFTE Journal, 1994; 26(2):134-135.

---. "False Breech Face ID's," AFTE Journal, 1996; 28(2):95-96.

Thornton, J.I., "The General Assumptions and Rationale of Forensic Identification," Chapter 20, Modern Scientific Evidence: The Law and Science of Expert Testimony, (D.L. Faigman, D.H. Kaye, M.J. Saks and J. Sanders, eds., 1997), Vol. 2, pp. 1-49.

---. "The Validity of Firearms Evidence," California Attorneys for Criminal Justice Forum, Vol. 5, No. 4, Aug. 1978, p. 15.

---. "The Validity of Firearms Evidence," AFTE Journal, 1979, 11(2):16.

Tuira, Y.J., "Tire Stabbing with Consecutively Manufactured Knives," AFTE Journal, 1982; 14(1):50-52.

Tulleners, F., Hamiel, J., and Giusto, M., "Striae Reproducibility on Sectional Cuts of Thompson Contender Barrel," paper presented at the 28th AFTE Training Seminar, Annapolis, MD, July 1997.

Uchiyama, T., "Similiarity Among Breech Face Marks Fired from Guns with Close Serial Numbers," AFTE Journal, 1986; 18(3):15.

---. "Change of Rifling Marks of the Bullets Fired from a Revolver," AFTE Journal, 1986; 18(4):40.

---. "A Criterion for Land Mark Identification," AFTE Journal, 1988; 20(3):236-251.

---. "A Criterion for Land Mark Identification Using Rare Marks," AFTE Journal, 1988; 20(3):260-268.

---. "Probability of Corresponding Striae in Toolmarks," AFTE Journal, 1992; 24(3):273-290.

Uchiyama, T., Igarashi, N., and Nagai, M., "Frequency of Occurrence of Individual Characteristics of Firearms on Fired Bullets," AFTE Journal, 1988; 20(4):376-390.

Uchiyama, T., and Nota, O., "Non-Firing Markings on Primer of Remington Cartridges," AFTE Journal, 1986; 18(4):78.

Uchiyama, T., and Tokano, K., "Non-Firing Markings on Shotshell Cases and Primers," AFTE Journal, 1988; 20(1):46.

Vandiver, J., "New Screwdrivers Production and Identification," AFTE Journal, 1976; 8(1):29-52.

Watson, D., “The Identification of Toolmarks Produced from Consecutively Manufactured Knife Blades in Soft Plastics,” AFTE Journal, 1978; 10(3):43-45.

The Daubert Decision and Toolmarks/Firearms Identification

Andersen, G.R., “Round Pegs in Square Holes: The Aftermath of Daubert,” South Carolina Trial Lawyers Association Bulletin, Fall, 1996, pp. 9-12.

Biasotti, A.A., and Murdock, J.E, “Firearms and Toolmark Identification: Scientific Status,” Chapter 23, Section 23-210. Modern Scientific Evidence: The Law and Science of Expert Testimony (D.L. Faigman, D.H. Kaye, M.J. Saks, and J. Sanders eds., West Publishing Co., 1997), Vol. 2, pp. 131-151.

Bohan, T.L., and Heels, E.J., “The Case Against Daubert: The New Scientific Standard’ and the Standards of the Several States,” Journal of Forensic Sciences, Vol. 40, No. 6, Nov. 1995, pp. 1030-1044.

Faigman, D.L., Kaye, D.H., Saks, M.J., and Sanders, J., Modern Scientific Evidence: Firearms and Toolmark Identification: Legal Issues, Section 23-1.0, West Publishing Co., 1997, Vol. 2, pp. 124-131.

Glossary of the Association of Firearms and Tool Mark Examiners (AFTE) AFTE Standardization Committee, published by Available Business Group, Chicago, IL, 3rd edition, 1994, Revision Section, June 6, 1994.

Grzybowski, R.A., and Murdock, J.E., “Firearm and Toolmark Examiners Meeting the Daubert Challenge,” AFTE Journal, 1998; 30(1):3-14.

Melson, G.R., “Qualifying as An Expert in State Court: The Impact of Daubert,” paper presented at the Fourth Annual Conference for Medical and Forensic Experts, Dec. 6-7, 1997, Newport Beach, CA.

Peterson, J.L., and Markham, P., “Crime Laboratory Proficiency Testing Results 1978-1991, II: Resolving Questions of Common Origin,” Journal of Forensic Sciences, Vol. 40, No. 6, Nov. 1995, pp. 1009-1029.

Relman, A.S., and Angell, M., “How Good is Peer Review?”, (an editorial), The New England Journal of Medicine, Vol. 321, No. 12,
September 21, 1989, pp. 827-829.

Ruchlis, H., Discovering Scientific Method, Harper and Row Publishers, New York, 1963.

Saks, M.J., “Implications of the Daubert Test for Forensic Identification Science,” Shepard’s Expert and Scientific Evidence, Vol. 1, No. 3, Winter, 1994, pp. 427-434.

Thornton, J.I., “Courts of Law v. Courts of Science: A Forensic Scientist’s Reaction to Daubert,” Shepard’s Expert and Scientific Evidence, Vol. 1, No. 3, Winter, 1994, pp. 475-485.

Technical Protocols, Case Work Notes and Reports

California Department of Justice Firearms/Toolmark Identification Training Syllabus: Professionalism, AFTE Journal, 1991; 23(2):716-718 (toolmark examination protocol).

---. AFTE Journal, 1991; 23(1):559-567 (case notes).

---. AFTE Journal, 1991; 23(2):719-726 (report writing)

Technical Examination Subtopics

Ammunition Manufacturing Processes

Crum, R.A., “Manufacturing Tool Mark Identification on the Base of Jacketed Bullets,” Crime Laboratory Digest, Vol. 12, No. 2, Apr. 1985, pp. 29-31.

Kellet, P.M., “The Identification of a Tool Mark on the Interior of a Semi-Jacketed Bullet,” AFTE Journal, 1984; 16(3):22.

---. “The Comparison and Identification of Toolmarks on the Base of Remington Semi-Jacketed Bullets,” AFTE Journal, 1984; 16(3):81-83.

---. “The Comparison of Mold Marks on Cast Bullets and Punch Marks in Copper Gas Checks,” AFTE Journal, 1984; 16(3):104-106.

Matty, W., “The Formation and Persistence of Toolmarks in the Cartridge Case Head Forming Process,” AFTE Journal, 1983; 15(1):108-113.

Nagai, M., and Uchiyama, T., “Identification of a Tool Mark on the Jacket of a Bullet," AFTE Journal, 1989; 21(1):80.

Quirk, T.W., “Toolmarks on Primers of □Rio’ Brand Ammunition,” AFTE Journal, 1987; 19(3):309-310.

Skolrood, R.W., “Do Not Disregard Mould Markings,” AFTE Journal, 1975; 7(1):73-74.

Swim, J.D., “Firearms Examiners Beware,” AFTE Journal, 1979; 11(1):33-34.

Automotive Ignitions

Arrowood, M.C., “Identification of a Metal Screw and Auto Ignition Cylinder,” AFTE Journal, 1983; 15(2):97.

Garland, P., “Identification of Dent Puller,” AFTE Journal, 1978; 10(3):38-40.

Paholke, A.R., “New Tool for Pulling Ignition Locks,” AFTE Journal, 1975; 7(3):17-20.

---. “Automobile Ignition Lock Puller,” AFTE Newsletter, Aug. 1969, p. 5.

Townshend, D.G., “Identification of Fracture Marks,” AFTE Journal, 1976; 8(2):74-75.

Beverage Tabs/Tops

Bridgemon, R.R., “The Individualization of Beverage Can Pull-Tabs,” AFTE Journal, 1984; 16(3):99-101.

Tenorio, F., “Identification of a Pop-Top’ Tab and Beer Can,” AFTE Journal, 1983; 15(2):56-57.

White, R., “An Unusual Tool Mark Case,” AFTE Journal, 1975; 7(1):19.

Boltcutters

Butcher, S.J., and Pugh, P.D., “A Study of Marks Made by Bolt Cutters,” Journal of the Forensic Science Society, Vol. 15, No. 2, Apr. 1975, pp. 115-126.

Cassidy, F., “An Unusual Tool Mark from a Bolt Cutter,” AFTE Journal, 1994; 26(1):21-22.

Hall, J., “Consecutive Cuts by Bolt Cutters and Their Effect on Identification,” AFTE Journal, 1992; 24(3):260-272.

Komar, S.M., and Scala, G.E., “Examiner Beware New Bolt Cutter Blades Class or Individual,” AFTE Journal, 1993; 25(4):298-300.

Bone and Cartilage

Bonte, W., “Toolmarks in Bone and Cartilage, Journal of Forensic Sciences, Vol. 20, No. 2, Apr. 1975, pp. 315-325.

Ernest, R.N., “Toolmarks in Cartilage Revisited,” AFTE Journal, 1991; 23(4):958-959.

Galan, J.I., “Identification of a Knife Wound in Bone,” AFTE Journal, 1986; 18(4):72-75.

Kelty, J.J., “Court Presentation of Toolmarks Identified in Stab Wounds,” AFTE Journal, 1985; 17(2):66.

Mikko, D., and Hornsby, B., “On the Cutting Edge II An Identification Involving a Knife,” AFTE Journal, 1995; 27(4):293.

Burglary Tools

Molnar, S., “Burglar Tools,” AFTE Newsletter, 1970, p. 42.

Cable and Wire

Biasotti, A.A., “A Comparison of Hatchet Cuts on Wire,” Journal of Criminal Law, Criminology and Police Science, Vol. 47, 1956, pp. 497-499.

Cilwa, R.B., and Townshend, D.G., “Tool Mark Identification, Knife to Cut Wire,” AFTE Journal, 1976; 8(4):66-67.

Dillon, D.J., “Comparisons of Extrusion Striae to Individualize Evidence,” AFTE Journal, 1976; 8(2):69-70.

Jordan, T., “Individual Characteristics on Copper Insulated Wire,” AFTE Journal, 1982; 14(1):53-56.

Kenny, R.L., “Identification of Insulating Material Surrounding Wires,” AFTE Journal, 1978; 10(2):64.

Molnar. S., “Identification by Extrusion Marks on Wire,” AFTE Newsletter, Jan. 1970, p. 22.

Ogle, R.R., and Mitosinka, G.T., “The Identification of Cut Multistranded Wires,” Journal of Forensic Sciences, Vol. 19, No. 4, Oct. 1974, pp. 865-867.

Schubert, K.D., “Toolmarks Link Bomb Components with Suspects,” AFTE Journal, 1985; 17(2):122-123.

Williams, D.L., “Comparison of Cut Telephone Cables,” AFTE Journal, 1979; 11(2):39-41.

Wilson, C.M., “The Comparison and Identification of Wire in a Coal Mine Bombing Case,” Journal of Criminal Law, Criminology and Police Science, Vol. 2, 1935-1936, pp. 873-902.

Casting Materials and Techniques

Barber, D.C., and Cassidy, F.H., "A New Dimension with Mikrosil' Casting Material," AFTE Journal, 1987; 19(3):328-329.

Biasotti, A.A., "Plastic Replicas in Firearms and Tool Mark Identifications," Journal of Criminal Law, Criminology and Police Science, Vol. 47, 1956, pp. 110-117.

Brundage, D., "Dip-Pak Thermo-Plastic," AFTE Journal, 1994; 26(4):307.

Carlson, C.J., "Use of Coe-Flex for Test Toolmarks," AFTE Journal, 1983; 15(2):87.

Frazier, R.A., "Toolmark Test Material," AFTE Journal, 1975; 7(1):25.

Goldman, G.L., "Coloring Casting Materials An Alternative to Smoking or Dusting Casts for Improved Visibility," AFTE Journal, 1981; 13(3):112-115.

Klees, Greg, "Casting Material Update on Toolmark Replication," AFTE Journal, 1988; 20(4):463.

McGraw, A.C., "Casting, Another Means of Identification," Journal of Forensic Sciences, Vol. 29, No. 4, Oct. 1984, pp. 1212-1222.

Molnar, S., "Wax Replicas of Tool Marks," AFTE Newsletter, Jan. 1970, p. 19.

Murdock, J.E., "Silicone Rubber Replicas of Tool Marks," AFTE Journal, 1970; 2(3):22-23.

Ojena, S.M., "A New Silicone Rubber Casting Material Designed for Forensic Science Application," Journal of Forensic Sciences, Vol. 29, No. 1, Jan. 1984, pp. 317-321.

Rees, P.O., and Cundy, K.R., "A Method for the Comparison of Tool Marks and Other Surface Irregularities," Journal of the Forensic Science Society, Vol. 9, 1969, pp. 153-155.

Thompson, R.W., "Sulfur Casting," AFTE Journal, 1980; 12(2):15.

Townshend, D.G., "Examination of Tree Stumps," AFTE Journal, 1981; 13(4):32-36.

Wilson, R.J., "Reproduced Impressed Markings for Comparison by Casting with Mikrosil," AFTE Journal, 1994; 26(3):181-184.

Dies

Van Dijk, T.M., "Steel Marking Stamps Their Individuality at the Time of Manufacture," Journal of the Forensic Science Society, Vol. 25, No. 4, Jul./Aug. 1985, pp. 243-253.

Watson, D.J., "Manufacturing Process of Crimping Dies and the Examination of Class versus Individual Characteristics Between Them," AFTE Journal, 1978; 10(3):19-21.

Drills/Lathes

Cilwa, R.B., and Townshend, D.G., "Identification of Lathe Shavings," AFTE Journal, 1978; 10(1):23.

McNickle, J., "Sharpening Twist Drills," AFTE Journal, 1988; 20(1):75-78.

Reitz, J.A., "An Unusual Tool Mark Identification Case," AFTE Journal, 1975; 7(3):40-43.

Firearms Components

Bishop, E.E., "Tool Mark Identification on a Black Powder Revolver," AFTE Journal, 1995; 27(4):310-313.

Davis, J.E., "Test Tool Marks from Weapon Parts May Facilitate Comparisons," AFTE Journal, 1972; 4(3):28.

Dragan, P., "Watch the Nose," AFTE Journal, 1974; 6(3):13-15.

La Voy, T.A., "Firearm/Tool Mark Identification on a Cap and Ball Revolver," AFTE Journal, 1977; 9(1):66-68.

Matty, W., "Raven .25 Auto Pistol Breech Face Tool Marks," AFTE Journal, 1984; 16(3):57-60.

Matty, W., and Johnson, T., "A Comparison of Manufacturing Marks on Smith and Wesson Firing Pins," AFTE Journal, 1984; 16(3):51-56.

Thompson, E., "Phoenix Arms (Raven) Breech Face Toolmarks," AFTE Journal, 1994; 26(2):134-135.

Verbeke, D.J., "Tool Mark on a Bullet," AFTE Journal, 1975; 7(2):86-90.

General Toolmark References

Arrowood, M.C., "Back to Basics," AFTE Journal, 1993; 25(3):197-198.

Burghardt, H.D., Machine Tool Operation, Vol. I & II, McGraw-Hill Book Company, Inc., NY, 1936.

Cochrane, D.W., "Class Characteristics of Cutting Tools and Surface Designation," AFTE Journal, 1985; 17(3):73-82.

Cook, C.W., A Practical Guide to the Basis of Physical Evidence, Chapter 16, Charles C. Thomas, IL, 1984.

---. "The Firearms/Tool Mark Investigator: An Excursion into the Realm of the Weird and Wonderful," AFTE Journal, 1979; 11(3):35-43.

Davis, J.E., An Introduction to Toolmarks, Firearms and the Striagraph, Charles C. Thomas, IL, 1958, pp. 3-67.

FBI Laboratory, Handbook of Forensic Science, toolmark identification subsection, (current edition).

"FBI Makes Tool Mark Examinations," FBI Law Enforcement Bulletin, Sep. 1950, pp. 1- 6.

Gibson, W.M., "AFTE Toolmark Article Index," AFTE Journal, 1996; 28(4):266-286.

Herb, C.O., Machine Tools at Work, Vol. I-VII, The Industrial Press, NY, 1942.

Kirk, P.L., "Tool Marks," in Crime Investigation, 2nd edition, J. I. Thornton (ed.), University of California, Berkeley, CA, 1974.

Paholke, A.R., "The Identification of Class Characteristics of Tool Marks: The Evidence Receipt Activity Report," AFTE Journal, 1978; 10(2):59-62.

---. "A Change in Technique," AFTE Journal, 1971; 3(5):14.

---. "Tool Mark, Two Words," AFTE Newsletter, Aug, 1969, p. 18.

Soderman, H., and O'Connell, J.J., "Traces of Tools," in Modern Criminal Investigation, 5th edition, Funk & Wagnalls, NY, 1962.

Versailles, J., "Tool Marks: Striated Versus Impressed," AFTE Journal, 1971; 3(5):13.

Impressions

Arrowood, M.C., and Berglund, J., "A Tool Mark Impression in a Unique Shooting Case," AFTE Journal, 1976; 8(2):83 (firearm hammer).

Johnson, A.P., "Hammer Spur Impresions, Physical Evidence in Homicides," FBI Law Enforcement Bulletin, Sep. 1983, pp. 11-14.

Molnar, S., "Unusual Tool Mark Impression Identification," AFTE Journal, 1970; 2(3):32-33.

Sherlock, W.E., "Ear Impression Case," AFTE Journal, 1991; 23(3):850-852.

Knives

Cilwa, R.B., and Townshend, D.G., "Tool Mark Identification, Knife to Cut Wire," AFTE Journal, 1976; 8(4):66-67.

Edwards, R.L., and Kelley, M.I., "The Straight Line (Springer) Knife," AFTE Journal, 1993; 25(1):7-10.

Fears, J.W., "An Expert's Guide to Knives, Part II," Shooting Times, Aug. 1987, pp. 48-51.

Garcia, C.H., "Are Knife-Prints' Reliable Evidence: An Analysis of Tool Mark Evidence and Ramirez v. State," AFTE Journal, 1993; 25(4):266-280.

Hardings, L.F., "A Glossary of Knife Terminology," AFTE Journal, 1982; 14(3):34-35.

Hollis, D., "The Knife, Man's Oldest/Modern Tool," Guns and Ammo, May 1986, pp. 56-72.

---. "Pocketknives, An American Tradition," Guns and Ammo, Aug. 1986, pp. 53-97.

Kockel, R., "About the Appearance of Clues or Marks from Knife Blades," AFTE Journal, 1980; 12(3):16-28.

Love, E., "Knives and Knife Terminology," AFTE Journal, 1989; 21(3):490-495.

Purtell, D.J., "The Identification of Paper Cutting Knives and Paper Cutters," Journal of Criminal Law, Criminology and Police Science, Vol. 44, 1953, pp. 262-268.

Watson, D.J., “The Identification of Tool Marks Produced from Consecutively Manufactured Knife Blades in Soft Plastic,” AFTE Journal, 1978; 10(3):43-45.

Lighting Techniques

Heard, B.J., “A New Approach to the Examination of Stria on Transparent and Translucent Materials,” AFTE Journal, 1986, 18(1):25-34.

Peterson, J.L., “Utilizing the Laser for Comparing Tool Striations,” Journal of the Forensic Science Society, Vol. 14, No. 1, Jan. 1974, pp. 57-62.

Winkel, N., “A New Method of Comparative Investigation of Trace Replicas,” Bulletin for the Forensic Laboratory, No. 2, Mar. 1979, pp. 8-10.

Ziegler, P.A., “Examination Techniques: The Beam Splitter and Reverse Lighting,” AFTE Journal, 1983; 15(2):37-41.

Locks and Keys

Molnar, S., “Bobby Pins . . . Lock Picking,” AFTE Newsletter, Oct. 1969, p. 28.

Paholke, A.R., “What a Toolmark Examiner Should Know About Locks (A Guide for the Firearms Examiner),” AFTE Journal, 1989; 21(2):147-150.

---. “Surreptitious Entry,” AFTE Newsletter, Oct. 1969, p. 25.

---. “Lock Picking,” AFTE Newsletter, Dec. 1969, p. 13.

---. “Terminology of Locks,” AFTE Newsletter, Jan. 1970, p. 4.

---. “Notes on Lock Decoder and Picking,” AFTE Newsletter, Oct. 1970, p. 28.

---. “Locksmith Terminology,” AFTE Newsletter, Feb. 1971, p. 30.

---. “Rim Cylinder,” AFTE Newsletter, Feb. 1971, p. 31.

---. “Lock Nomenclature,” AFTE Newsletter, Aug. 1971, p. 16.

---. “Pen . . . A Lock Picking Device,” AFTE Newsletter, Aug. 1971, p. 24.

---. “A Key,” AFTE Newsletter, Feb. 1972, p. 14.

---. “A New Lock with Magnetic Key,” AFTE Newsletter, Aug. 1972, p. 21.

---. “A Twist on Unauthorized Entry,” AFTE Newsletter, Feb. 1973, p. 28.

---. “Pick Proof Locks,” AFTE Journal, 1975; 7(2):96-97.

Plumtree, W.G., “The Examination of Disc and Pin Tumbler Locks for Tool Marks Made by Lock Picks,” Journal of Forensic Sciences, Vol. 20, No. 4, Oct. 1975, pp. 656-667.

---. “Examination Techniques for Picked Locks,” AFTE Journal, 1982; 14(4):23-24.

Sherlock, W.E., and Paholke, A.R., “Comparison of Microscopic Striae on Keys,” AFTE Journal, 1982; 14(4):20-21.

Striupaitis, P.P., “Compression Spring Marks on Lock Pins,” AFTE Journal, 1982; 14(4):22.

Townshend, D.G., “The Lock Popper,” AFTE Journal, 1975; 7(3):61-62.

“Physical Security Devices, Part II,” The Chicago Police Department Training Bulletin, Vol. 15, No. 11, June 24, 1974.

“Physical Security Devices, Part III,” The Chicago Police Department Training Bulletin, Vol. 15, No. 12, July 8, 1974.

Miscellaneous Examination Subtopics

Arrowood, M.C., “A Tool Mark Identification with a Pop Rivet Gun,” AFTE Journal, 1987; 19(3):305.

Bailey, T., “What’s to Know About Files,” AFTE Journal, 1986; 18(4):105-110.

Bishop, E.E., “Tool Mark Identification on Nails,” AFTE Journal, 1995; 27(4):306-309.

Boudreau, A.J., “Significant Baling Wire Characteristics,” AFTE Journal, 1975; 7(2):99-103.

Good, R.G., “Tool Mark Identification in a Gambling Case: Identification of Illegally Manufactured Slugs,” AFTE Journal, 1979; 11(3):49-50.

Hamby, J.E., “Matching of Tool Marks Made in Rubber,” AFTE Newsletter, Jun. 1972, p. 18.

Harden, L.R., “Tool Marks on a Rape Case,” AFTE Journal, 1979; 11(1):25.

Lambert, R.R., “A Tool Mark Case,” AFTE Newsletter, Aug. 1970, p. 34 (lock puller).

Lane, P., “Toolmarks on Battery Terminals,” AFTE Journal, 1988; 20(2):151-153.

Larsen, D., “Murder -- Buttons and Toolmarks,” AFTE Newsletter, Dec. 1971, p. 15.

Mason, J.J., and Grose, P., “The Individuality of Toolmarks Produced by a Label Maker Used to Write Extortion Notes,” Journal of Forensic Sciences, Vol. 32, No. 1, Jan. 1987, pp. 137-147.

Meyers, C., “Tool Marks on Paper Matches,” AFTE Journal, 1977; 9(2):131.

Molnar, S., “Cutting Torch Marks,” AFTE Newsletter, Aug. 1970, p. 32.

Piper, A.G., “The Matching of Secateurs to a Harvested Marijuana Crop □ A Case Report,” Journal of the Forensic Science Society, Vol. 25, No. 4, Jul./Aug. 1985, pp. 281-283.

Roberts, J.L., “Razor Blade Manufacturing Information,” AFTE Journal, 1976; 8(1):80-84.

Seestrom, J.L., and Lansing, J.F., “A Spot Identification,” AFTE Journal, 1975; 7(2):66-67.

Serpa, J., “Identification of Manufacturing Marks on Nylon Cable Ties,” AFTE Journal, 1994; 26(3):187-192.

Vaughan, R.T., and Gilman, P.L., “An Identification With a Puncture Type Tool,” AFTE Journal, 1981; 13(4):78.

Versailles, J., “Toolmarks on Painted Metal,” AFTE Journal, 1973; 5(3):22.

Warren, G., “Glass Cutter Identification,” AFTE Journal, 1991; 23(4):925-927.

Photographic Techniques

Baney, R.E., “An Examination of Consecutive Scratch Marks on Kodak Instant Print Film,” AFTE Journal, 1981; 13(4):112-113.

Biasotti, A.A., “Photography and Illumination: Some Critical Factors, AFTE Journal, 1979;11(4):60.

Catterick, T., and Taylor, M., “A Photometric Method for the Quantitative Mapping of Parallel Striated Marks,” Forensic Science International, Vol. 33, 1987, pp. 197-207.

Sanchez, D.W., “Aluminum Oxide Casting, Technique for Comparison and Photography of Toolmarks,” AFTE Newsletter, August, 1970, p. 20.

Townshend, D., “Photography and Casting Toolmarks,” FBI Law Enforcement Bulletin, Vol. 45, No. 4, 1976, pp. 9-11.

Ward, D.C., and Sibert, R.W., “The Use of Vacuum Evaporation of Metals for Surface Feature Enhancement,” AFTE Journal, 1986; 18(4):76-77.

Physical/Fracture Matches

Agron, N., and Schecter, B., “Physical Comparisons and Some Characteristics of Electrical Tape,” AFTE Journal, 1986; 18(3):53-59.

Brundage, D., “Glue Sticks Rapist in Joint,” AFTE Journal, 1975; 7(1):75-77.

Caine, C., and Thompson, E., “Physical Match of an Automobile Roof to the Body Section,” AFTE Journal, 1989; 21(4):632-634.

Dixon, T.R., “Trace Evidence in a Toolmarks Case,” AFTE Journal, 1975; 7(1):70-71.

Funk, H.J., “Comparison of Paper Matches,” Journal of Forensic Sciences, Vol. 13, No. 1, Jan. 1968, pp. 137-143.

Hathaway, R.A., “Physical Match of a Broken Pool Cue Stick,” AFTE Journal, 1994; 26(3):185-186.

Laux, D.L., “Identification of a Rope by Means of a Physical Match Between the Cut Ends,” Journal of Forensic Sciences, Vol. 29, No. 4, Oct. 1994, pp. 1246-1248.

Moran, B., “An Interesting Physical Match,” CAC News, Summer 1995, p. 19.

---. “Physical Match/Tool Mark Identification Involving Rubber Shoe Sole Fragments,” AFTE Journal, 1984; 16(3):126-128.

Reich, J.E., “A Comparative Photography Case,” AFTE Journal, 1978; 10(3):23.

Striupaitis, P., “Physical Fit □ Public Utility Cable,” AFTE Journal, 1981; 13(4):48-49.

Townshend, D.G., “Identification of Fracture Marks,” AFTE Journal, 1976; 8(2):74-75.

Verbeke, D.J., “An Indirect Identification,” AFTE Journal, 1975; 7(1):18-19.

White, R., and Arrowood, M., “Ultraviolet Fluorescence and a Physical Match,” AFTE Journal, 1975; 7(2):105-106.

Plastic Bags and Sheet Materials

Castle, D.A., Gibbins, B., and Hamer, P.S., “Physical Methods for Examining and Comparing Transparent Plastic Bags and Cling Films,” Journal of the Forensic Science Society, Vol. 34, 1994, pp. 61-68.

Ford, K.N., “The Physical Comparison of Polythene Film,” Journal of the Forensic Science Society, Vol. 15, No. 2, Apr. 1975, pp. 107-113.

Kopec, R.J., and Meyers, C.R., “Comparative Analysis of Trash Bags A Case History,” AFTE Journal, 1980; 12(1):23-26.

Meyers, C.R., “Toolmarks on a Plastic Bag,” AFTE Journal, 1988; 20(1):55-56.

Stone, R.S., “The Examination and Comparison of Plastic Bags Used in Home Heat Sealers,” AFTE Journal, 1986; 18(1):21-23.

Pliers

Cassidy, F.H., “Examination of Toolmarks from Sequentially Manufactured Tongue-and-Groove Pliers,” Journal of Forensic Sciences, Vol. 25, No. 4, Oct. 1980, pp. 796-809.

Reloading

LaVoy, T.A., and Wilmer, J.H., “Tool Markings from a Reloading Die,” AFTE Journal, 1979; 11(2):37-38.

Safes

Dixon, T.R., “Trace Evidence in a Toolmarks Case,” AFTE Journal, 1975; 7(1):70-71.

Murdock, J.E., “Positive Association Through Tool Marks of a Safe Door Hinge Pin with a Damaged Safe,” AFTE Journal, 1981; 13(3):72-78.

Sherlock, W.E., Fournier, R.J., and McCown, R., “Examination of a Drilled’ Safe,” AFTE Journal, 1988; 20(4):441-442.

Templin, R.H., “A Safe Tool Mark,” AFTE Journal, 1980; 12(2):20.

“Physical Security Devices, Part V,” The Chicago Police Department Training Bulletin, Vol. 16, No. 2, Jun. 23, 1975.

“Physical Security Devices, Part IV,” The Chicago Police Department Training Bulletin, Vol. 16, No. 1, Jan. 13, 1975.

Saws

Andahl, R.O., “The Examination of Saw Marks,” Journal of the Forensic Science Society, Vol. 18, No. 1, Jan. 1978, pp. 31-46.

Cayton, J.C., “Hacksaw Blade, Shotgun Barrel, Toolmark Case,” AFTE Journal, 1973; 5(3):7.

Cook, C.W., A Practical Guide to the Basics of Physical Evidence, Charles C. Thomas, IL, 1984, p. 213.

Molnar, S., “Saw Cuts and Log Ends,” AFTE Newsletter, Apr. 1970, p. 30.

Paholke, A.R., “Rotary Saw,” AFTE Newsletter, Feb. 1971, p. 27.

Scanning Election Microscopy

Castro, S.M., Galbreath, N.W., Pecko, J.L., Hellman, F.N., and Rowl, W.F., “Use of the Scanning Electron Microscope to Examine Film Impressions on Typewriter Correction Tape,” Journal of Forensic Sciences, Vol. 40, 1995, pp. 291-295.

Matricardi, V.R., Clark, M.S., and DeRonja, F.S., “The Comparison of Broken Surfaces: A Scanning Electron Microscope Study,” Journal of Forensic Sciences, Vol. 20, 1975, pp. 507-523.

Ward, D., and Sibert, R.W., “The Use of Vacuum Evaporation of Metals for Surface Feature Enhancement,” AFTE Journal, 1986; 18(4):76-77.

Screwdrivers

Burd, D.Q., and Gilmore, A.E., “Individual and Class Characteristics of Tools,” Journal of Forensic Sciences, Vol. 13, No. 3, Jul. 1968, pp. 390-396.

Cook, C., A Practical Guide to the Basics of Physical Evidence, Charles C. Thomas, IL, 1984, p. 221.

Newquist, A.M., “Screwdriver Identified to Bullet Base,” AFTE Journal, 1978; 10(2):68.

Reich, J.E., “A Comparative Photography Case,” AFTE Journal, 1978; 10(3):23.

Vandiver, J.V., “New Screwdrivers, Production and Identification,” AFTE Journal, 1976; 8(1):29-52.

Speedometers

Stoner, D., and Zeldes, I., “An Aid in Accident Investigation,” FBI Law Enforcement Bulletin, Mar. 1980, p. 11.

Staplers/Staples

Hamby, J.E., “The Comparison of Staples,” AFTE Journal, 1974; 6(5&6):16-17.

Hofmeister, A.G., “Examination of Stapler Toolmarks,” AFTE Journal, 1981; 13(4):76.

Murdock, J.E., “The Individuality of Tool Marks Produced by Desk Staplers,” 1974; 6(5&6):23-39.

Test/Known Toolmark Production Techniques

Davis, J.E., “Indium Metal for Toolmarks, AFTE Journal, 1973; 5(4):29.

McGuire, D.L., and Kennington, R., “Comparative Micrography Techniques,” AFTE Journal, 1977; 9(1):7-14.

McGuire, D.L., and Brodie, T.G., “Standard Toolmark Production Device,” AFTE Journal, 1975; 7(1):33-37.

Molnar, S., “Techniques for Making Test Tool Marks Involving a Vise and C-Clamp,” AFTE Newsletter, 1970; 2(6):26-30.

Tires

Bridgemon, R.R., “The Examination of Cut Tires,” AFTE Journal, 1984; 16(3):102-103.

Rathman, G.A., “Tires and Toolmarks,” AFTE Journal, 1992; 24(2):146-159.

Tuira, Y.J., “Tire Stabbing with Consecutively Manufactured Knives,” AFTE Journal, 1982; 14(1):50-52.

Tool Orientation Effects

Deinet, W., “Studies of Models of Striated Marks Generated by Random Processes,” Journal of Forensic Sciences, Vol. 26, No. 1, Jan. 1983, pp. 35-50.

Maheshwari, H.S., “Influence of Vertical Angle of a Tool on Its Tool Mark,” Forensic Science International, Vol. 18, No. 1, Jan. 1981, pp. 5-12.

Trace Evidence Concerns

Dixon, T.R., “Trace Evidence in a Toolmarks Case,” AFTE Journal, 1975; 7(1):70-71.

Murdock, J.E., “Associative Evidence,” AFTE Journal, 1984; 16(2):5.

Versailles, J., “Metal Residue Build-Up on Tool Blades,” AFTE Journal, 1974; 6(4):7.

Vehicles

Arrowood, M.C., and Berglund, J.S., “Examination of Toolmarks from a Vehicle Involved in a Hit and Run,” AFTE Journal, 1983; 15(2):100-101.

Brinkman, R.W., “An Unusual Tool Mark Comparison from a Hit and Run Case,” AFTE Journal, 1978; 10(1):33.

Lapierre, J., “Two Interesting and Unusual Tool Mark Cases,” AFTE Journal, 1978; 10(2):57-58.

Smith, R.M., “Another Hit and Run Toolmark Case,” AFTE Newsletter, Dec. 1972, p. 31.

Townshend, D.G., “Identification of Hub and Wheel,” AFTE Journal, 1975; 7(1):56-58.

Wilson, R., “Examination of Toolmarks from a Vehicle Involved in a Burglary,” AFTE Journal, 1983; 15(2):98-99.

Wood

Hathaway, R.A., “Physical Match of a Broken Pool Cue Stick,” AFTE Journal, 1994; 26(3):185-186.

Jordan, T., “A □Stumped’ Case,” AFTE Journal, 1981; 13(1):15-20.

Lapierre, J., “Two Interesting and Unusual Tool Mark Cases,” AFTE Journal, 1978; 10(2):57-58.

Mezger, O., Hasslacher, F., and Frankle, P., “Identification of Marks Made on Trees,” American Journal of Police Science, 1930, pp. 358.

Molnar, S., “Saw Cuts and Log Ends,” AFTE Newsletter, Apr. 1970, p. 70.

Robinson, M.K., “Comparison of Growth Rings in Wood to Identify Clock Parts,” AFTE Journal, 1976; 8(1):88-91.

---. “Comparison of Gunstock Parts to Barreled Action,” AFTE Journal, 1976; 8(1):65-69.

Townshend, D.G., “Examination of Tree Stumps,” AFTE Journal, 1981; 13(4):32-36.

Versailles, J., “Tool Markings on Balsam Branches,” AFTE Journal, 1974, 6(1):10.

“Wood as Evidence,” FBI Law Enforcement Bulletin, Oct. 1975, pp. 5-7.

M. SERIAL NUMBER RESTORATION

1. Read the Handbook of Methods for the Restoration of Obliterated Serial Numbers, by Tretow. Be prepared to discuss the theory of number restoration.

   (*Use Training Assignment #61 to complete this objective*.)

   _____ _____
   Training Officer Date

2. Sketch the entire stressed area above and below the indentation of a stamped item and depict what remains when the indented area is removed.

   (*Use Training Assignment #61 to complete this objective*.)

   _____ _____
   Training Officer Date

3. Make a list of the various methods used to mark items by private industry. This list should include but not be restricted to: casting, stamping, embossing, debossing, coining, vibratory pencil, laser and electrical discharge machining.

   a. Discuss with the Training Officer the effect each of these marking techniques has on the subsurface of the marked area.
   b. Discuss with the Training Officer the marking methods used that can directly affect the ability of the examiner to restore any obliterated markings and why.

   (*Use Training Assignment #61 to complete this objective*.)

   _____ _____
   Training Officer Date

4. Define in your notebook the term "*plastic deformation*" of metal.

   (*Use Training Assignment #61 to complete this objective*.)

   _____ _____
   Training Officer Date

5. Briefly discuss in your notebook and with your Training Officer the difference between cold rolled steel and cast iron metal.

   (*Use Training Assignment #61 to complete this objective*.)

   _____ _____
   Training Officer Date

6. Discuss with your Training Officer the effect that the following types of alterations will have on the subsurface of the marked item and how it will impact on the results of the examiner.

   a. grinding
   b. over stamping
   c. pinging
   d. gouging
   e. heating
   f. puddling
   g. welding
   h. removal
   i. combinations of the above

(*Use Training Assignment #61 to complete this objective*.)

_____ _____
Training Officer Date

7. Determine the telltale signs that can be left by the various alteration methods. Discuss how these signs will determine your specific approach to the restoration attempt.

(*Use Training Assignment #62 to complete this objective*.)

_____ _____
Training Officer Date

8. Discuss with your Training Officer the different types of lighting (*e.g., incandescent, infrared, UV, and fluorescent*) and how they can improve or enhance the restoration results. Be prepared to explain how the angle of incidence of these lighting techniques might vary the results.

(*Use Training Assignment #62 to complete this objective*.)

_____ _____
Training Officer Date

9. Discuss the various methods of surface preparation such as sanding and polishing and how they will affect the results in the restoration attempt.

(*Use Training Assignment #62 to complete this objective*.)

_____ _____
Training Officer Date

10. Determine the chemical reaction that takes place when etching is conducted and document in your notebook the appropriate chemical formulations for the general reactions of acid with steel and aluminum.

(*Use Training Assignment #62 to complete this objective*.)

_____ _____
Training Officer Date

11. Determine whether the reaction rate for the stressed area is faster or slower than the etching rate of the rest of the surface and why.

(*Use Training Assignment #62 to complete this objective*.)

_____ _____
Training Officer Date

12. Determine the specialized equipment that might be used in number restoration and discuss these your Training Officer.

(*Use Training Assignment #62 to complete this objective*.)

_____ _____
Training Officer Date

13. Discuss with your Training Officer the appropriate photography techniques and procedures to be used before, during, and after restoring obliterated serial numbers.

(*Use Training Assignment #62 to complete this objective*.)

_____ _____
Training Officer Date

14. Determine the various types of film utilized for number restoration photography. Be prepared to discuss with your Training Officer under what circumstances each would be used.

(*Use Training Assignment #62 to complete this objective*.)

_____ _____
Training Officer Date

15. Research the various kinds of magnifying and enhancing equipment used for number restoration and explain when and why each would be used.

(*Use Training Assignment #62 to complete this objective*.)

_____ _____
Training Officer Date

16. Become familiar with the following chemicals:

a. $CuNH_4Cl_2$
b. $CuCl_2$
c. NaOH
d. HCl
e. HNO_3
f. KCN
g. K_2SO_4
h. Aqua Regia
i. H_2SO_4
j. $FeCl_3$
k. H_2O_2
l. Tartaric acid
m. Ammonium Persulfate

(*Use Training Assignment #62 to complete this objective*.)

_____ _____
Training Officer Date

17. Obtain the proper safety equipment (*e.g., eyewear, masks, gloves, and lab coats*) before attempting any chemical restorations. Review the chemical hygiene policies to insure proper safety precautions are used.

_____ _____
Training Officer Date

18. Define and place in your notebook these common chemical terms:

a. Fryes Reagent
b. Arais Reagent
c. Hydrofluoric acid
d. Turner's Reagent
e. Davis' Reagent

(*Use Training Assignment #63 to complete this objective*.)

_____ _____
Training Officer Date

19. Become knowledgeable of the numbering systems and methods used by various firearm manufacturers including but not limited to Colt, Ruger, Smith & Wesson, US Repeating Arms (Winchester) and Remington.

(*Use Training Assignment #63 to complete this objective*.)

_____ _____
Training Officer Date

20. Determine the best chemicals and techniques to use in number restoration of the following firearms:

    a. Colt pistol
    b. Smith & Wesson revolver
    c. RG Industries revolver
    d. Ruger stainless steel revolver
    e. chrome/nickel 25 caliber autoloading pistol
    f. shotgun alloy receiver
    g. shotgun casehardened receiver
    h. Winchester rifle

    (*Use Training Assignment #63 to complete this objective*.)

    _____ _____
    Training Officer Date

21. Obtain several firearms from your Training Officer, alter the serial numbers using different methods and then attempt to restore them. Prepare notes and photographs to substantiate your conclusions and results.

    (*Use Training Assignment #63 to complete this objective*.)

    _____ _____
    Training Officer Date

22. Be prepared to discuss with your Training Officer the methods used and lessons learned during the restoration process.

    (*Use Training Assignment #63 to complete this objective*.)

    _____ _____
    Training Officer Date

23. Obtain several pieces of aluminum that have had stamped numbers removed. Attempt to restore these numbers using various techniques. Prepare notes and photographs to substantiate your conclusions and results.

    _____ _____
    Training Officer Date

24. Discuss with your Training Officer how the combination of brief application of $CuNH_4Cl_2$ followed by normal NaOH application can shorten the processing time on aluminum.

    (*Use Training Assignment #63 to complete this objective*.)

    _____ _____
    Training Officer Date

25. Discuss with your Training Officer why alternating HNO_3 and HCl can work so well on chrome or nickel plated firearms.

(*Use Training Assignment #63 to complete this objective*.)

_____ _____
Training Officer Date

26. Research the effect of D. C. electricity (Include the proper polarity and voltage for enhance etching/development of obliterated numbers and letters) on the reaction time of the different chemical techniques you have learned. Conduct restorations using this method.

(*Use Training Assignment #63 to complete this objective*.)

_____ _____
Training Officer Date

REFERENCE MATERIALS
RESTORATION OF OBLITERATED MARKINGS

The following reference materials serve several purposes:

- to provide a wider range of additional resources should you have a particular interest in a given topic.
- to provide reference materials for your future professional use.
- to allow you to gain additional depth in particular subject areas.

Should you encounter other references in this category, you are encouraged to make additional notes about them at the end of this listing.

Books

Brandt, D., Metallurgy Fundamentals, Goodheart-Wilcox Co., Inc., 1992.

Cook, C.W., "A Practical Guide to the Basics of Physical Evidence" Colorado Bureau of Investigation, April 1975.

Cook, C.W., "Chemical Etching Reagents for Serial Number Restoration" Colorado Bureau of Investigation, April 1975.

Doane, F.B., Principles of Magnaflux Inspection, Photopress Publishing, Inc., 1940.

Hatcher, J.S., Jury, F.J., and Weller, J., Firearms Investigation, Identification and Evidence, 2nd edition, Stackpole Books, Harrisburg, PA, 1977.

Hein, Morris, et al., Foundations of College Chemistry, Dickenson Publishing Co., 1977.

Kegser, C.A., Basic Engineering Metallurgy - Theories, Principles and Applications, 6th edition, Prentice-Hall, Inc., Englewood Cliffs, N.J., 1957.

Kehl, G.L., The Principles of Metallographic Laboratory Practice, 3rd edition, McGraw-Hill, New York, 1949.

Kotz and Purcell, Chemistry and Chemical Reactivity, Saunders College Publishing, 1991.

Krcma, V., The Identification and Registration of Firearms, Charles C. Thomas, Springfield, IL, 1971.

Mathews, J.H., Firearms Identification, Volume I, Charles C. Thomas, Springfield, IL, 1962, pp. 77-80.

Polk, D.E., and Giessen, B.C., Metallurgical Aspects of Serial Number Recovery, Institute of Chemical Analysis-Northeastern University, Boston, MA (undated).

Treptow, R.S., Handbook of Methods for the Restoration of Obliterated Serial Numbers, NASA, 1978.

Vander Voort, G.F., Metallography, Principles and Practice, McGraw-Hill, 1984.

Van Klock, L.H., Elements of Materials Science and Engineering, Addison-Wesley Publishing Company, 1985.

Professional Journals

Katterwe, H., "Modern Approaches For the Examination of Toolmarks and Other Surface Marks," Forensic Science Review, Vol. 8, No. 1, Jun. 1996, pp. 46-71.

---. "The Recovery of Erased Numbers in Polymers," Journal of Forensic Science Society, Vol. 34, 1994, pp. 11-16.

Krcma, V., "The Identification of Pistols by Serial Numbers and Other Markings," Journal of Forensic Sciences, 1961.

"Metallurgy vs. Crime," FBI Law Enforcement Bulletin, Vol. 19, No. 11, Nov. 1950, p. 8.

"Restoring Altered and Obliterated Markings on Metal," FBI Law Enforcement Bulletin, Vol. 25, No. 7, Jul. 1956, p. 13.

Thorton, J.I., and Cashman, P.J., "The Mechanism of the Restoration of Obliterated Serial Numbers by Acid Etching," Journal of the Forensic Science Society, Vol. 16, No. 69, 1976.

Turley, D.M., "Restoration of Stamp Marks on Steel Components by Etching and Magnetic Techniques," Journal of Forensic Sciences, Vol. 32, No. 3, May 1987.

Young, S.G., "The Restoration of Obliterated Markings by Ultrasonically Induced Cavitation in Water," Journal of Forensic Sciences, Vol. 19, No. 4, 1974, p. 820.

AFTE Journal

Barabash, T., and Fahey, R.T., "Non-Destructive Methods of Restoring Defaced Serial Numbers," 1977; 9(1):23.

Brundage, D.J., "Surface Preparation for Serial Number Restoration," 1982; 14(4):9.

Cantor, A., "Serial Number Restoration with Image Enhancement on the FBI Drugfire Computer," 1997; 29(2):223-230.

Cook, C.W., "Chemical Etching Reagents for Serial Number Restoration," 1975; 7(2):80.

---. "Obliterated Serial Numbers," 1975; 7(1):27.

---. "Obliterated Serial Numbers," 1989; 21(2):166-167.

Deats, B., "Serial Number Restoration Information," 1980; 12(3):82.

Dragan, P., "Abrasive Wheels for Serial Number Restoration Preparation," 1996; 28(1):21.

Garland, P.V., "Training the Firearms Examiner," 1971; 3(1):32.

Harden, L.R., "Reader Reporter," 1988; 20(2):171-173.

Heflin, T.M., "Examination of Serial Number Over-Stamp," 1984; 16(3):12.

Hueske, E.E., "Browning Firearms Serial Numbering System," 1988; 20(1):59-60.

Keisler, M.A., “Smith and Wesson Model SW9F and the Hidden Serial Number,” 1997; 29(2):186-187.

Knowles, M., “Instant Recovery of Obliterated Serial Numbers,” 1985; 17(3):63.

Lee, F.R., “Helpful Hint,” 1977; 9(2):37.

Lutz, M.C., “Evaluation of New Fiber Optics System,” 1986; 18(1):12.

Massiah, E.E., “Compilation of Techniques and Chemical Formulae Used in the Restoration of Obliterated Markings,” 1976; 8(2):26.

Miller, J., “Book Review: The Law and Forensic Ballistics by T.A. Warlow,” 1997; 29(2):239, 173.

Miller, K.E., “Current Assist for Die Stamp Impression Restoration,” 1972; 4(3A):38.

Montgomery, J.L., “New Process Restores Filed Serial Numbers,” 1975; 7(3):80.

Nielson, B.C., “Restoration of Die Stamped Impressions on Metal,” 1972; 4(3):32.

O’Reilly, W.E., “Magnetic Restoration of Serial Number,” 1970; 2(3):26.

Paholke, A.R., “Restoration of Serial Numbers,” 1969; 1(4):38.

Polk, D.E., and Giessen, B.C., “Metallurgical Aspects of Serial Number Recovery,” 1975; 7(2):38.

---. “Metallurgical Aspects of Serial Number Recovery,” 1989; 21(2):174-181.

Roberts, V., “Restoration of Serial Numbers in Plastic,” 1981; 13(4):40.

Schaefer, J.R., “Serial Number Restoration Observation,” 1987; 19(3):276-278.

Sherlock, W.E., and Keating, D.M., “Obliterated Serial Number Tracking Program,” 1995; 27(4):264-280.

Taulbee, D., “3x5 Card File of Die Stamped Impressions on Metal,” 1973; 5(3):18.

Thompson, R.W., “Second Serial Number on Tarus Model 80 Revolvers,” 1980; 12(2):18.

Vaughan, R.T., “Serial Number Restoration on a Radar Warning Device,” 1987; 19(3):304.

---. “Technique for Restoring Obliterated Serial Numbers on Plastic Cards,” 1981; 13(2):30.

N. RESEARCH PROJECT, REPORT WRITING, EXPERT TESTIMONY AND EXTERNAL LABORATORY REVIEW AND TOURS

1. Formulate a method of taking notes in your cases, that is, how to note essential data on which you base your conclusions, to document chain of custody, to identify a case with a particular contributor and with a particular file. Develop a system for the administration of your cases. Discuss the above areas with your Training Officer.

_____ _____
Training Officer Date

2. Read through copies of reports generated by at least two examiners for the purpose of familiarization with report format and phraseology. Compile a reference file which reflects correct phraseology divided into appropriate categories, i.e., bullet examination, bullet "*no conclusion*," bullet identification, cartridge case identification, firearms function, accidental discharge, gunshot residues, etc. Discuss this with your Training Officer.

_____ _____
Training Officer Date

3. Attend moot courts of other trainees during your training period and evaluate the demeanor and professionalism of the trainee. Discuss this with your Training Officer.

_____ _____
Training Officer Date

4. Review several transcripts of at least two examiners regarding their "*expert*" testimony in the field of firearms/toolmark identification. Discuss these transcripts with each examiner.

_____ _____
Examiner Date

_____ _____
Examiner Date

_____ _____
Training Officer Date

5. Discuss the meaning and/or definition of the following terms or phrases, as they apply to testimony in the field of firearms/toolmark identification, with your Training Officer.

   a. expert witness
   b. reasonable degree of scientific certainty
   c. hearsay
   d. opinion
   e. voir dire

_____ _____
Training Officer Date

6. Prepare a list of "*qualification questions*" which can be used by the prosecutor in court to qualify you as an expert witness. Include in this questions which can be used as a guide for the introduction in court of evidence which you have examined. Discuss this with your Training Officer.

_____ _____
Training Officer Date

7. Observe at least two examiners testifying as an "*expert witness*." Discuss their testimonies with each examiner. Coordinate this with your Training Officer.

_____ _____
Examiner Date

_____ _____
Examiner Date

_____ _____
Training Officer Date

8. Confer with other examiners regarding personal hints and recommendations in regard to courtroom testimony. This discussion should be lengthy and cover all aspects of the topic.

_____ _____
Examiner Date

_____ _____
Examiner Date

_____ _____
Examiner Date

_____ _____
Examiner Date

_____ _____
Training Officer Date

REFERENCE MATERIALS
RESEARCH PROJECT

The following reference materials serve several purposes:

- to provide a wider range of additional resources should you have a particular interest in a given topic.
- to provide reference materials for your future professional use.
- to allow you to gain additional depth in particular subject areas.

Should you encounter other references in this category, you are encouraged to make additional notes about them at the end of this listing.

Research Techniques

Bennis, W., On Becoming a Leader, Addison-Wesley, Reading, MA, 1989.

Carr, J.J., The Art of Science: A Practical Guide to Experiments, Observations, and Handling Data, High Text Publications, San Diego, CA, 1992.

Copi, I.M., Introduction to Logic, 7th edition, MacMillan, NY, 1986.

Halpern, D.F., Thought and Knowledge: An Introduction to Critical Thinking, 2nd edition, Lawrence Erlbaum Associates, Hillsdale, NJ, 1989.

Herceg, E.E., Handbook of Measurement and Control, Shawitz Engineering, Pennsauken, NJ, 1972.

Jaffe, A.J., and Spirer, H.F., Misused Statistics: Straight Talk about Twisted Numbers, Marcel Dekker, Inc., NY, 1987.

Langley, R., Practical Statistics, Dover Publications, NY, 1968,1970.

Paul, R., Critical Thinking: What Every Person Needs to Survive in a Rapidly Changing World, Sonoma State University, Rohnert Park CA, 1980.

Smith, G., Statistical Reasoning, Allyn & Bacon, Needham Heights, MA, 1991.

Tukey, J., and Mosteller, F., Data Analysis and Regression, Addison Welsey, Reading, MA, 1977.

Self-Directed Learning

Cross, P.K., Adults as Learners, Jossey-Bass, San Francisco, 1981.

Drumheller, S.J., Handbook of Curriculum Design for Individualized Instruction: a Systems Approach, Educational Technology Publications, Englewood Cliffs, NJ 1971.

Dunn, R., and Dunn, K., Practical Approaches to Individualizing Instruction, Parker Publishing Co., West Nyack, NY, 1972.

Knowles, M.S., The Modern Practice of Adult Education, Follet Publishing, Chicago, 1980.

Knowles, M.S., and Associates, Andragogy in Action: Applying Modern Principles of Adult Learning, Jossey-Bass, San Francisco, 1984.

Knowles, M.S., Self-Directed Learning: A Guide for Learners and Teachers, Association Press, New York, 1975.

Knowles, M.S., The Adult Learner: A Neglected Species, Gulf Publishing Co., Houston, TX, 1973.

Messick, S., and Associates, Individualization in Learning, Jossey-Bass, San Francisco, 1976.

REFERENCE MATERIALS
ORAL PRESENTATIONS AND COURT TESTIMONY

The following reference materials serve several purposes:

- to provide a wider range of additional resources should you have a particular interest in agiven topic.
- to provide reference materials for your future professional use.
- to allow you to gain additional depth in particular subject areas.

Should you encounter other references in this category, you are encouraged to make additional notes about them at the end of this listing.

General

Andersen, G.R., "Round Pegs in Square Holes: The Aftermath of Daubert," South Carolina Trial Lawyers Association Bulletin, Fall, 1996, pp. 9-12.

Babitsky, S., and Mangravati, J.J., How to Excel During Cross-Examination; Techniques for Experts That Work, SEAK, Inc., Falmouth, MA.

Bailey, F.L., and Rothblatt, H.B., Investigation and Preparation of Criminal Cases, Federal and State, The Lawyers Co-operative Publishing Company, Rochester, NY, and the Bancroft-Whitney Company, San Francisco, CA, 1970.

---. Crimes of Violence: Homicide and Assault, The Lawyers Co-operative Publishing Company, Rochester, NY, and the Bancroft-Whitney Company, San Francisco, CA, 1973.

Biasotti, A.A., and Murdock, J.E., "Firearms and Toolmark Identification: Legal Issues and Scientific Status," Chapter 23, Modern Scientific Evidence: The Law and Science of Expert Testimony, (Faigman, D.L., Kaye, D.H., Saks, M.J., and Sanders, J., eds., West Publishing Co., 1997), Vol. 2, pp. 124-151.

Bohan, T.L., and Heels, E.J., "The Case Against Daubert: The New Scientific Standard' and the Standards of the Several States," Journal of Forensic Sciences, Vol. 40, No. 6, Nov. 1995, pp. 1030-1044.

Bradley, M.D., The Scientist and Engineer in Court, American Geophysical Union, Washington, DC, 1983.
Bronstein, D.A., Law for the Expert Witness, CRC Press, Boca Raton, FL, 1998.

Burke, J.J., "Testifying in Court," FBI Law Enforcement Bulletin, Sep. 1975.

Hatcher, J.S., Jury, F.J., and Weller, J., Firearms Investigation, Identification and Evidence, 2nd edition, Stackpole Books, Harrisburg, 1957, pp. 445-460.

Matson, J.V., Effective Expert Witnessing, CRC Press, Boca Raton, FL, 1994.

Melson, G.R., "Qualifying as An Expert in State Court: The Impact of Daubert," paper presented at the Fourth Annual Conference for Medical and Forensic Experts, Dec. 6-7, 1997, Newport Beach, CA.

Meyer, C.B., Expert Witnesses Explaining and Understanding Science, CRC Press, Boca Raton, FL, 1998.

Moenssens, A.A., Moses, R.E., and Inbau, F.E., Scientific Evidence in Criminal Cases, The Foundation Press, Mineola, NY, 1973.

Molloy, J.T., New Women's Dress for Success, Warner Books, 1996.

---. John T. Molloy's New Dress for Success, Warner Books, 1988.

Moses, R.E., Scientific Proof in Criminal Cases A Texas Lawyers Guide, The Lakeland Press, 1969.

Neal, M.W., "From the Hot Seat: Tips for Effective Courtroom Testimony," Forensic Focus The Journal of The West Virginia State Police Forensic Laboratory, Vol. 1, No. 2, Jul.-Dec. 1995, pp. 1, 11-13.

Saks, M.J., "Implications of the Daubert Test for Forensic Identification Science," Shepard's Expert and Scientific Evidence, Vol. 1, No. 3, Winter, 1994, pp. 427-434.

Sibert, R.W., "Laboratory Examinations Conducted Within the Field of Firearms Identification: A Tracing of the Acceptance by the Courts of Their Use in Expert Testimony," paper submitted to the George Washington University Department of Forensic Sciences, 1973.

Thornton, J.I., "Courts of Law v. Courts of Science: A Forensic Scientist's Reaction to Daubert," Shepard's Expert and Scientific Evidence, Vol. 1, No. 3, Winter, 1994, pp. 475-485.

AFTE Journal

Adler, M., "How to Refute the Experts Told Members at Lawyers' Club Meeting," 1972; 4(3):26.

Bell, V.P., "Admissibility of Evidence of Experiments," 1980; 12(3):51.

Bisbing, R.E., and Wilmer, J.H., "Admissibility of Fingernail Identification Undecided in Michigan," 1985; 17(2):96.

Boyle, P.J., "Role of the Expert Witness," 1989; 21(4):639.

"California Department of Justice Firearms Toolmark Identification Training Syllabus: Professionalism," 1991; 23(1):554-558 (court appearances).

"California Department of Justice Firearms Toolmark Identification Training Syllabus: Professionalism," 1991; 23(2):727-738 (demonstrative evidence and expert testimony).

Chicago Tribune, "False Testimony," 1980; 12(3):84.

Crossman, E.B., "Qualifications of a Ballistics Expert," 1985; 17(3):119.
District Court of Oklahoma, "Transcript of Bullet Examination Testimony," 1986; 18(1):71.

"Effective Expert Testimony," 1972; 4(4):8.

Garrison, D.H., “Intent Behind the Bullet,” 1993; 25(4):294-296.

---. “Little Gunmen: Shooting Reconstruction Miniatures,” 1991; 23(3):836-848.

Grzybowski, R.A., and Murdock, J.E., “Firearm and Toolmark Examiners Meeting the Daubert Challenge,” 1998; 30(1):3-14.

Hathaway, R.A., “Inadmissibility of Photographs,” 1979; 11(2):52.

Hodge, E.E., and Blackburn, B.D., “Courtroom Demeanor Information,” 1984; 16(4):35.

---. “Firearms/Toolmark Examiner in Court,” 1979; 11(4):70.

---. “Firearms/Toolmark Examiner in Court,” 1989; 21(2):232-242.

Hodge, S.A. and Blackburn, S.A., "The Firearms-Toolmark Examiner in Court", October 1979.

Joling, R.J., and Stern, W.W., “An Overview of Firearms Identification Evidence for Attorneys, II: Applicable Law of Recent Origin,” 1981; 13(4):134-139.

---. “An Overview of Firearms Identification Evidence for Attorneys, III: Qualifying and Using the Firearms Examiner as a Witness,” 1981; 13(4):140-144.

---. “An Overview of Firearms Identification Evidence for Attorneys, IV: Practice and Procedures When Using the Firearms Examiner and Demonstrative Evidence,” 1981; 13(4):145-148.

Keefe, J.F., “Forensic Sciences: Criminal Justice System Viewed by the Defense,” 1980; 12(2):59.

Mann, M., Henson, G., Stone, R., and Guerra, S., “Visual Aides for Firearm Training and Courtroom Testimony,” 1994; 26(4):309-310.

“Maryland State Court of Appeals. Appeals Case: (Olen J. Kelly et. al. vs. R.G. Industries, Inc., et. al.),” 1986; 18(2):77.

Miller, K.E., “Proof of Opinion,” 1973; 5(2):8.

Molnar, S., “Some Comments on Testifying in Court,” 1971; 3(3):46.

Moses, R.E., “Scientific Proof in Criminal Cases: A Texas Lawyer’s Guide,” 1989; 21(2):123-128.

Munhall, B.D., “Tools for the Firearm Examiner in Tort Matters,” 1972; 4(3):11.

Murdock, J.E., “Some Suggested Court Questions to Test Criteria for Identification Qualifications,” 1992; 24(1):69-75.

“Science in Criminal Law Newsletter,” 1980; 12(3):85.

Tanton, R.L., “Jury Preconceptions and Their Effect on Expert Scientific Testimony,” 1980; 20(2):67.

Townshend, D.G., “Observation of the Witness,” 1973; 5(4):26.

White, R.H., “Idle Thoughts Concerning Admissibility,” 1976; 8(4):50.

Wilson, C.M., “Evidence in Firearms Cases,” 1983; 15(2):83.

REFERENCE MATERIALS
EXTERNAL LABORATORY REVIEW AND TOURS

The following reference materials serve several purposes:

- to provide a wider range of additional resources should you have a particular interest in a given topic.
- to provide reference materials for your future professional use.
- to allow you to gain additional depth in particular subject areas.

Should you encounter other references in this category, you are encouraged to make additional notes about them at the end of this listing.

Books

Kirk, P.L., and Bradford, L.W., The Crime Laboratory: Organization and Operation, Charles C. Thomas, Springfield, IL, 1965.

Osterberg, J.W., The Crime Laboratory, Clark Boardman Company, Ltd., New York, NY, 1982.

Periodicals

Cadman, W.J., "How to Get the Best from Your Laboratory," The Police Chief, Feb. 1978, pp. 64-70.

Professional Journals

Fisher, A.J., "Developing a Forensic Science Laboratory," Journal of Forensic Sciences, 1986, pp. 1177-1184.

AFTE Journal

Bradford, L.W., "Barriers to Quality Achievement in Crime Laboratory Operations," 1983; 15(2):71.

Fleming, P.J., and Purtell, D., "Scientists or Factory Workers?, " 1989; 21(2):119-120.

Howe, W.J., "Crime Lab Study Funded By NIJ," 1980; 12(3):73.

Lucas, D.M., "Laboratory Director's View of the Firearms Section," 1989; 21(2):188-190.

Rabren, C.L., "Laboratory Accreditation, " 1982; 14(3):36.

Serrill, M.S., "Forensic Sciences: Overburdened, Underutilized," 1980; 12(4):58.

Research Reports

Law Enforcement Assistance Administration, Utilization of Criminalistics Services by the Police, U.S. Government Printing Office, Washington, DC, 1974.

National Institute of Justice, Forensic Evidence and the Police: The Effects of Scientific Evidence on Criminal Investigations, U.S. Government Printing Office, Washington, DC, 1984.

Manuals

American Society of Crime Laboratory Directors, Laboratory Accreditation Board Manual, current edition.