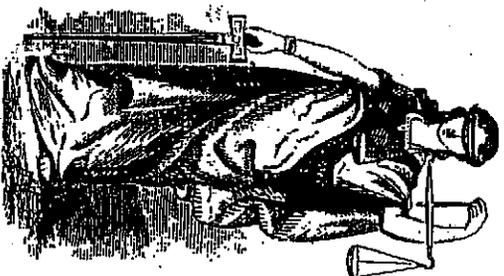


**CONTINUING LEGAL EDUCATION
WINTER 2009**

January 12, 2009

Top Gun: Understanding Ballistics

James Gannalo and Scott Klein, Esq.



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FACTS ON FIREARMS OPERABILITY AND IDENTIFICATION

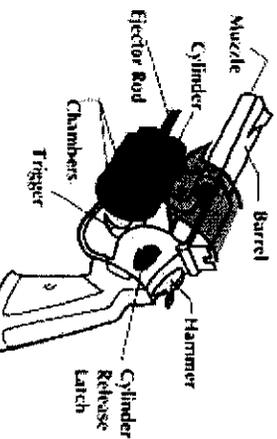
Prepared by: James M. Gannalo, Stria Consulting Group Inc.

REVOLVER



DEFINITION: A revolver is a solid or hinged framed handheld firearm with a cylinder that contains a number of chambers that hold cartridges. The number of chambers depends upon the caliber of the weapon and the design by the manufacturer of the firearm.

DOUBLE-ACTION REVOLVER



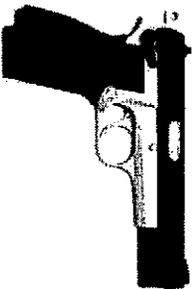
LOADING PROCEDURE: Using the *cylinder release latch*, allow the cylinder to move away from the frame and expose the *empty chambers*. Fill each chamber with a live cartridge and swing the cylinder into the frame and allow it to lock into place. The weapon is now loaded and ready to fire.

FIRING THE WEAPON: Discharging a revolver can be accomplished in two ways, single and double action modes. In *single action*, the *hammer* is pulled to the rear and locked into place with the internal sear. When the *trigger* is depressed, the hammer is released forward and strikes the firing pin on the primer of the live cartridge in line with the *barrel* of the revolver. This action crushes the primer, creating a spark that is used to ignite the propellant in the cartridge case. This propellant burns and creates a gas that expands under tremendous pressure which pushes the bullet down the weapon and out of the *muzzle*.

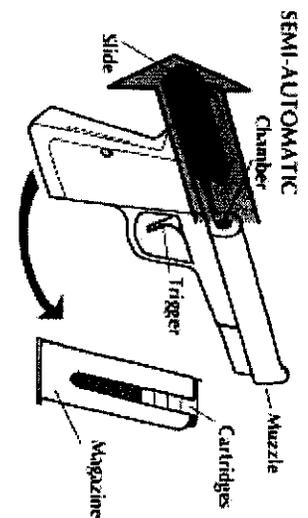
Double action is the same process but in this case the hammer is not cocked back first allowing the squeeze of the trigger to both pull it rearward and release it forward.

UNLOADING PROCEDURE: Repeat the steps listed in the loading procedure to swing the cylinder out of the frame. Use the *ejector rod* to eject the cartridge cases from the chambers of the revolver.

PISTOL



DEFINITION: A semi-automatic pistol is a self-loading weapon that with automatically unload and reload itself each time it discharges. This firearm will discharge with each successive squeeze of the trigger.



LOADING PROCEDURE: Using the *magazine release*, drop the *magazine* out of the *receiver* of the pistol. Fill the magazine with live cartridges and replace the magazine into the *magazine well*. Manually, pull the *slide* rearward and release. This strips off the first cartridge and pushes it into the *chamber* of the pistol. The weapon is now loaded and ready to fire.

FIRING THE WEAPON: When the *trigger* is depressed, the hammer (if external) or striker (if internal) is released forward and strikes the firing pin on the primer of the live cartridge in the chamber. This action crushes the primer, creating a spark that is used to ignite the propellant in the cartridge case. This propellant burns and creates a gas that expands under tremendous pressure which pushes the bullet down the weapon and out of the *muzzle*.

The energy released by the discharge of the round is used to automatically push rearward on the slide allowing the *extractor* to pull the *cartridge case* from the chamber. The base of the cartridge case contacts with the *ejector* causing it to be expelled from the *ejector port* and away from the pistol.

The slide continues rearward and then is moved forward by spring tension. Moving forward, the slide strips off the next round in the magazine and pushes it into the chamber of the pistol. The trigger must be squeezed for each successive shot.

UNLOADING PROCEDURE: Repeat the steps listed in the loading procedure to release the magazine from the frame. REMOVE THE ROUND IN THE CHAMBER by manually pulling back on the slide allowing this round to be extracted and ejected. ONLY then is the weapon actually unloaded.

COMMON FIREARM DEFINITIONS:

ACTION: The mechanism of a firearm.

AMMUNITION: Bulleted ammunition consisting of a cartridge case, gunpowder, primer and projectile.

SEMI-AUTOMATIC: Often misused term "self-loading". When correctly applied to a pistol or rifle, it signifies a weapon whereby the action will continue to operate automatically, **ONLY** when the finger squeezes the trigger of the weapon.



AUTOMATIC FIREARM (FULLY AUTOMATIC): A firearm that may be discharged successively without interruption by a single actuation of its firing device until its ammunition supply is exhausted or until it has been deliberately stopped by its user.

BARREL: Tube that guides the bullet or projectile (shot charge); interior passage grooved in rifles and handguns, smooth in shotguns.

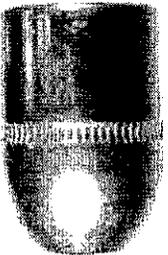
BATTERY: When the standing breech of a weapon is correctly aligned and ready to fire.

BOLT: Generally a sliding rod that pushes a cartridge into the firing chamber as it closes and locks the breech in a breech loading rifle.

BOLT HANDLE: The extension of the bolt from which it is operated.

BORE: The inside of the barrel. The bore diameter of a weapon for rifled weapons it is usually the land or minimum diameter. This is expressed in either inches or millimeters.

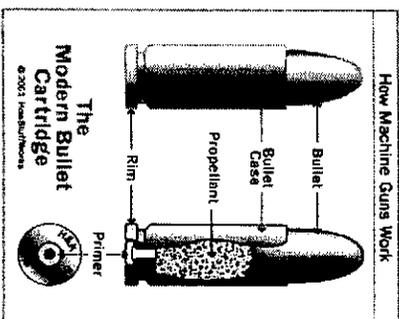
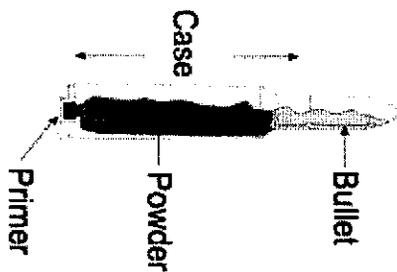
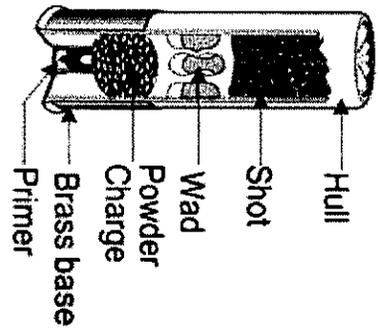
BREECH FACE: The portion of the breechblock that comes into contact with the cartridge case.



BULLET: The projectile(s) of bore diameter that comes out of the muzzle of a small arm.

CALIBER: The measurement of the bore diameter of a firearm expressed in inches, although such a measurement may be frequently stated in millimeters.

CARTRIDGE: A complete unit of ammunition for small arms consisting of a cartridge case, primer, propellant, and projectile, which is inserted into the firing chamber.



Illustrations of Common Ammunition

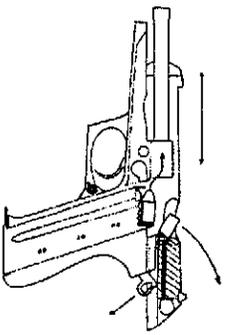
CHAMBER: That portion of a firearm in which the cartridge is placed for firing. In cannons, rifles, shotguns, single shot pistols, and semiautomatic pistols it is the interior of the rearward portion of the barrel. In revolvers the chambers are located in the revolving cylinder.

COCK: To place a firing mechanism under spring tension.

CYLINDER: The rotating part of a revolver which contains the chambers.

DISCHARGE: The firing of a weapon

DOUBLE ACTION: A method of operating a revolver whereby a single long and relatively heavy pull on the trigger rotates the cylinder cocks the hammer then drops it all in one action. Some self-loading pistols also have a double action trigger mechanism where a long pull on the trigger cocks the hammer then drops it to fire the weapon.



EJECTION: The act of expelling a fired cartridge case from a weapon.

EJECTION PORT: The opening in the receiver or slide of a self-loading or automatic weapon through which the fired cartridge case is ejected.

EJECTOR: Generally a small pin or bar which the cartridge case strikes when it has been pulled out of the chamber by the extractor.

EXTRACTOR: A spring-loaded claw attached to the bolt or breechblock which engages in the extractor groove as the breech is closed. When the breech is opened the extractor claw extracts the cartridge from the chamber.

FIREARM: Any instrument that projects a missile by gas pressure generated by the combustion of a propellant.

FIRING PIN: Part of the action that transmits the force which detonates the primer.

HAMMER: The component of a firearm which provides the force on the firing pin to discharge the primer

LOADED: A firearm is loaded when a cartridge is in its firing chamber. However, for safety reasons all firearms are always treated as loaded at all times.

MAGAZINE: A removable or fixed device designed to hold cartridges for feeding into the firing mechanism of a firearm.

MUZZLE: End of the barrel from which a projectile exits.

PISTOL: A non-repeating, repeating, or semiautomatic Small Arm designed and intended to be efficiently discharged by a single individual, using one hand, also called a Handgun.

PRIMER: That component of ammunition that ignites the propelling charge when struck by the firearm's firing mechanism.

PROPELLANT: In firearms, the chemical compound or mixture of chemical compounds which when ignited produces a high volume of gases. These gases are used to propel a missile from the barrel of a weapon.

RECEIVER: The portion of a firearm that contains the operating parts and into which the barrel is fitted.

RECOIL: Backwards motion of the firearm when fired.

SAFETY: Refers to a mechanical device on a firearm intended to lock the firing mechanism to prevent discharge.

SEAR: The device in a firearm, which holds the hammer in a cocked position until released by the trigger, during discharge. It is as a mechanism designed to prevent accidental discharge of a firearm.

SLIDE: The portion of a firearm that moves rearward allowing the cartridge case to be extracted and ejected from the weapon.

SLIDE RELEASE: The lever that locks the slide in an open position.

STRIKER: Firing pin or part of the action which strikes the firing pin found in hammerless firearms

FIREARMS IDENTIFICATION

SOME HISTORY

One of the earliest references concerning the rifling of firearms is in book authored by Harold Peterson wherein he discusses the rifling of firearms by Emperor Maximilian of Germany between 1493 and 1508. Although some firearms were rifled - helical grooves in the bore of a firearm barrel to impart rotary motion to a projectile - the recognition that this rifling was of value for identifying a fired projectile to the firearm didn't occur until late in the 19th century.

In the early part of this century (1900 - 1930), the science of firearm and toolmark identification was recognized by numerous judicial (law) systems in several countries around the world. Legal recognition was due, in part; to the efforts of several individuals from various countries around the world that had conducted research and experiments into the identification of fired projectiles and cartridges cases to the specific firearms.

In the middle part of this century (1930 - 1970), the science of firearm and toolmark identification continued to evolve. In the United States, the Scientific Crime Detection Laboratory (SCDL) began operations at Northwestern University in late 1929, followed by formation of the Federal Bureau of Identification (FBI) Laboratory in 1932.

Additionally, many other countries also recognized the requirement to provide this type of forensic analysis and established firearm and toolmark sections either in existing laboratories or as new laboratories. Over the next few years, several laboratories were established and commenced operations, especially in many of the larger cities in Canada, the United Kingdom and the United States.

In the last part of the twentieth century (1970 - 1999), the science of firearms and toolmark identification continued to evolve with a greater number of forensic scientists being employed as firearm and toolmark examiners around the world. Many of these examiners conduct research and experimentation into the various aspects of our field and have published their findings in many of the leading forensic publications. The science has greatly benefited from the numerous technological advances that have occurred during this time period. These advances include innovations in one of the primary tools of the firearm and toolmark examiner, the comparison microscopes.

The most significant advances during this period include the tremendous growth, popularity, and relatively inexpensive cost of computers. The ability to fully utilize the vast potential of computers has allowed science overall, and forensic science more specifically, to take full advantage in development of several useful 'tools' for use within the laboratory. The ongoing development of computers has provided the firearms and toolmark examiner with such useful equipment as the IBIS Systems.

Using advanced computer technology, this system allows for the capturing of digital images of fired bullets and cartridge casings which are then analyzed to provide the examiner with a list of possible 'hits' for examination using a comparison microscope.

Although this computerized ballistics system has become more technically advanced in the last decade, it still takes a trained microscopic examiner to determine if the "hit" is actually a positive comparison or not.

MICROSCOPIC CONCLUSIONS

The following are the only acceptable conclusions for microscopic examination relating to ballistic evidence. The examiner uses his/her training and experience to determine a conclusion based on existing class and individual characteristics.

IDENTIFICATION – Agreement of a combination of individual characteristics and all discernable class characteristics where the extent of agreement exceeds that which can occur in the comparison of toolmarks made by different tools and is consistent with the agreement demonstrated by toolmarks known to have been produced by the same tool.

INCONCLUSIVE –

- Some agreement of individual characteristics and all discernable class characteristics, but insufficient for identification.
- Agreement of all discernable class characteristics without agreement or disagreement of individual characteristics due to an absence, insufficiency, or lack of reproducibility.
- Agreement of all discernable class characteristics and disagreement of individual characteristics, but insufficient for an elimination.

ELIMINATION – Sufficient disagreement of discernable class characteristics and/or individual characteristics.

UNSUITABLE – Unsuitable for microscopic examination.

NOTE: Bullets can only be compared to bullets and cartridge cases can only be compared to cartridge cases. A recovered bullet cannot be compared to a cartridge case. Test samples fired from a recovered firearm are used to link bullets and cartridge cases to a particular weapon. Test samples are created by firing the weapon a number of times in a bullet recovery tank and recovering the bullets and cartridge cases.

COMMON FIREARM IDENTIFICATION DEFINITIONS

BALLISTICS - The study of moving projectiles. Internal ballistics deals with what happens inside of firearm upon discharge. External ballistics is the study of a projectile's flight, and Terminal ballistics is the study of the impact of a projectile.

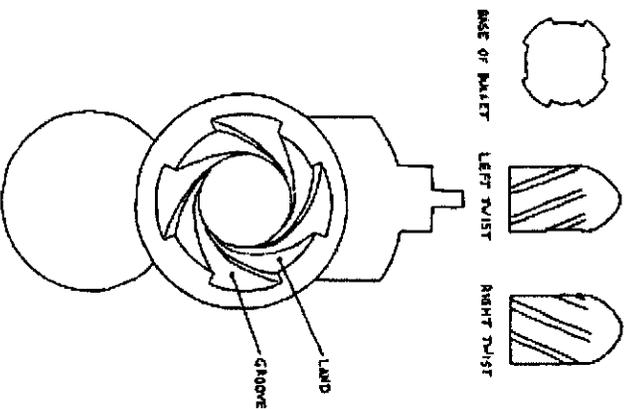
BARREL - Tube that guides the bullet or projectile (shot charge); interior passage grooved in rifles and handguns, smooth in shotguns.



BEARING SURFACE - The portion of the bullet which comes into contact with a barrel's rifling

BREECH FACE - The portion of the breechblock that comes into contact with the cartridge case.

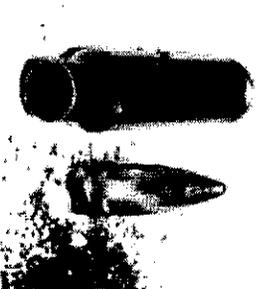
BREECH FACE MARK - Impressions left on the cartridge case caused by pressure during discharge.



BULLET GROOVE - The portion of the bullet engraved by the raised part of the barrel's rifling. When viewing a cross section of a fired bullet, the bullet grooves will be the parts on the bearing surface of the bullet which are depressed.

BULLET LAND - The portion of the bullet not engraved by the raised part of the rifling in the bore of the weapon. When viewing a cross section of a fired bullet, the bullet lands will be the parts on the bearing surface of the bullet which are standing proud of the rest.

CALIBER - The measurement of the bore diameter of a firearm expressed in inches, although such a measurement is frequently stated in millimeters. It is correctly expressed as “.40 caliber” (note the decimal point) or as “10 millimeter” (without “caliber” or the leading decimal point).

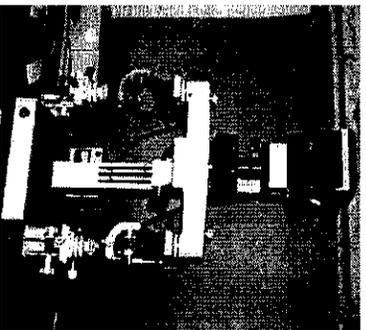


CARTRIDGE CASE - Refers to the ammunition case and primer and does not include the bullet. Can be either a “fired cartridge case” or a “live cartridge case”. A “live cartridge case” has a live, unfired, primer but there is no propellant or bullet present.

CHAMBER MARKS - Individual microscopic marks present on the chamber walls as a result of manufacturing.

CHAMBER - That portion of a firearm in which the cartridge is placed for firing. In cannons, rifles, shotguns, single shot pistols, and semiautomatic pistols it is the interior of the rearward portion of the barrel. In revolvers the chamber(s) are located in the revolving cylinder. Used as a verb (to chamber) it means to place a cartridge in a firearm’s chamber in preparation for firing.

CLASS CHARACTERISTICS - Characteristics of a particular make firearm or ammunition.



COMPARISON MICROSCOPE - Basically two normal microscopes mounted together and connected by an optical bridge to one set of eye pieces. This allows the comparison of two objects simultaneously.

EJECTOR - Generally a small pin or bar which the cartridge case strikes when it has been pulled out of the chamber by the extractor.

EJECTOR MARKS - Marks left on the base of a fired or sometimes unfired cartridge case by the ejector.

EXTRACTOR - A spring-loaded claw attached to the bolt or breechblock which engages in the extractor groove as the breech is closed. When the breech is opened the extractor claw extracts the cartridge from the chamber.

EXTRACTOR GROOVE - The groove in a cartridge just forward of the cartridge head into which the extractor engages.

EXTRACTOR MARK - The mark left in the extractor groove of a cartridge.

FIREARMS IDENTIFICATION - A discipline of forensic science concerned with the forensic examination of arms and ammunition.



FIRING PIN DRAG MARKS - Marks caused by the firing pin dragging across the primer during the extraction process

FIRING PIN IMPRESSION - The mark left on the primer of a fired cartridge case by the firing pin

FIRING PIN: Part of the action that transmits the force which detonates the primer.

GRAIN - Avoirdupois measurement of weight with 7,000 grains equaling one pound.

GROOVE - Spiral cuts or impressions inside a barrel which rotate the projectile and stabilize its flight.

INDIVIDUAL CHARACTERISTICS - Those marks produced during manufacture or subsequently due to corrosion, mistreatments etc. which are individual to that weapon and serve to distinguish it from all other firearms.

JACKET – The metal coating placed on a lead bullet

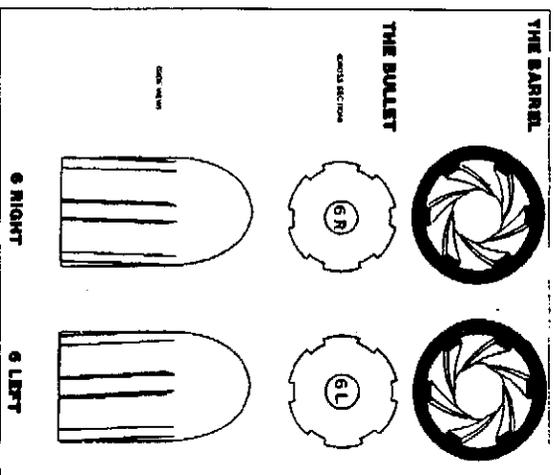
MICROSCOPIC EXAMINATION - The comparison of two items under a comparison microscope.

PRIMER - That component of ammunition that ignites the propelling charge when struck by the firearm's firing mechanism. Some military cannon ammunition primers are electrically fired. Small metal cap holding compound that is detonated by the firing pin.

POLYGONAL RIFLING - Rifling grooves which have a rounded rather than a sharp edged profile

PROPELLANT - In firearms, the chemical compound or mixture of chemical compounds which when ignited produce a high volume of gases. These gases are used to propel a missile from the barrel of a weapon

RIMFIRE CARTRIDGE - A design of ammunition in which the Primer is located around the outside edge of the base of the cartridge case.



RIFLING - The spiral cut into the bore to impart a spinning motion to the bullet designed to stabilize a projectile in flight. Normally, the rifling is composed of Lands and Grooves. The lands are the parts of the bore left standing after the grooves have been cut away.

WAD - A card, felt or plastic sealing device in a shotgun cartridge. Generally configured as an Over-Powder, Cushion Wad, Under-Shot and/or Over-Shot.

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The Stria Consulting Group consists of an assortment of experienced forensic experts who are outstanding in their disciplines and are available to assist attorneys in both civil and criminal matters. Each associate has testified as an expert witness on hundreds of occasions in courtrooms throughout New York City.

The Stria organization selects only the most qualified individuals to become associates and preserves strict professional standards for each member. The core of the group consists of former New York City Police Department Detectives who had been assigned to the Forensic Investigative Division and are accomplished forensic experts with more than ten years experience. Each associate has been retained by counsel in civil and criminal cases involving murder, assault as well as product and individual liability.

Our associates are well versed in requirements associated with the ASCID/LAB standards employed by modern laboratories. Additionally, our associates have trained hundreds of police officers, investigators, criminalists and students in laboratories and at universities throughout the region. A number of our members have created forensic training curriculum that are used in laboratories to instruct examiners and technicians in a variety of fields.

Let the Stria Consulting Group assist you in preparing for cases related to:

- Firearms identification and analysis of ballistics evidence
- Shooting incident reconstruction
- Crime scene analysis and reconstruction
- Disputed wills, Deeds and Contracts
- Forged checks and Medical records
- Trace and Biological evidence recovery
- Preservation and classification of forensic evidence
- Analysis of recovered trace paint particles
- Microscopy and instrumental analysis
- Toxicology and pharmacology analysis
- Forensic Photography and Diagram preparation
- Latent and patent print development, evaluation and examination
- DNA analysis review and evaluation
- Forensic computer investigations and recovery
- Arson and explosion investigation

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THE ASSOCIATES

James M. Gannalo—Firearms Identification

Attorneys practicing in New York City are well aware of the numerous shooting related death and injury cases pending throughout the justice system. In each of these civil or criminal cases, issues can be raised related to the examination of ballistics evidence. It is imperative that counsel completely comprehends the complex results recorded in lab reports and the results of microscopic analysis. In many of these cases, a retained forensic firearms examiner can prove invaluable.

James M. Gannalo is a practicing forensic firearms consultant and expert witness with nineteen years of practical experience in the fields of firearms operability, microscopic analysis of ballistics evidence and shooting incident reconstruction. Mr. Gannalo has provided professional assistance in hundreds of cases involving both criminal prosecution and civil litigation since his service retirement as a detective from the New York City Police Department in 1998. To date, Mr. Gannalo has testified as an expert witness in almost five hundred and eighty cases since 1989.

Mr. Gannalo has been retained by counsel as a forensic consultant in criminal and civil litigation in New York, New Jersey, Connecticut, Texas, New Hampshire, Pennsylvania, Florida, Maryland and Virginia. Additionally he has assisted in shooting reconstruction cases in a number of cities and states, a mass grave investigation in El Salvador and a military shooting incident in Iraq for officials in Abu Dhabi, UAE. He has trained other forensic examiners for the NYPD and the Philadelphia Police Department since 2000, lectured at Hofstra, St. John's and John Jay University and provided instruction to hundreds of investigators and police officers in police departments and government agencies throughout the region.

Richard T. Picciocchi—Questioned Documents

We live in a world of documents and rely on them to represent important information regarding our financial, legal, business, social and personal affairs. Sometimes these documents are not what they purport to be. A Forensic Document Examiner can assist attorneys in resolving most disputed document problems by a scientific examination of handwriting, by the physical examination of the document itself and by providing expert opinions and testimony. Forensic document examination should not be confused with graphology or graphoanalysis.

The Stria Corporation's Forensic Document Examiner is Richard T. Picciocchi. He is a forensic scientist with over twenty years of experience in the ASCILD accredited NYPD Crime Laboratory. Mr. Picciocchi has examined thousands of handwriting,

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signature and questioned document cases, participated in numerous high profile investigations and testified in trials including the "Zodiac" homicides and the terrorist attack on the World Trade Center. Now in private practice, he specializes in the examination of signatures, handwriting and other document problems. Mr. Picciochi is ABFDE certified, proficiency tested and court qualified.

Mercurio Veltri - Criminalist

Retired NYPD detective Mercurio Veltri is a practicing forensic consultant, expert witness, forensic instructor and training consultant in various fields of forensic science. Dr. Veltri became a member of the NYPD crime laboratory in 1984 and was assigned more than 2,500 forensic analysis cases, the majority of which were homicide investigations. His duties allowed an opportunity to provide expert witness testimony in over 250 criminal trials in New York, Queens, Kings, Bronx and Richmond Counties and the Southern & Eastern Districts of the US Federal Court System. He participated in a large number of major cases involving sensitive topics; police involved shootings, questionable homicide cases and disputed witness claims

While assigned as a member of the NYPD Laboratory, his responsibilities included training newly assigned members in various analytical techniques related to proper laboratory protocols. Dr. Veltri provided, as a senior examiner, technical supervision of the NYPD Laboratory Trace Evidence Unit. He developed management and quality assurance methods as they related to modern scientific instruments. Additionally, he created and administered instruction courses for members of the NYC Medical Examiners Office, Firearms Analysis Section, Bomb Squad, Police Academy and the Crime Scene Unit of the NYPD.

Dr. Veltri was designated as a speaker for a number of training courses including the NYPD Criminal Investigation Course, Executive development course and Precinct Level Weapons of Mass Destruction Training courses. He has provided professional instruction for continuing legal education to a number of attorneys including members of the Staten Island District Attorney's Office. Dr. Veltri educated college students as an adjunct assistant professor for Saint John's University, College of Professional Studies, Criminal Justice Program from 1990 through 2001. Recently, Dr. Veltri has collaborated with Mr. Picciochi in creating an accredited forensic science program for Hofstra University.

ADDITIONAL ASSOCIATES

The Stria Consulting Group also retains a number of associates who share their respective expertise in a variety of forensic sciences while assisting attorneys and governmental agencies in various cases. A few of these extremely qualified individuals are:

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Hal Sherman – Crime Scene Reconstruction

Mr. Sherman is a retired NYPD detective and practicing forensic crime scene consultant, expert witness, instructor and training consultant. Assigned to the NYPD Crime Scene Unit in 1987, Hal has investigated more than 2,500 Crime Scenes including more than 1,900 Homicide Investigations. His duties afforded an opportunity to provide expert witness testimony in over 200 criminal trials in New York, Queens, Kings, Bronx and Richmond Counties, Southern & Eastern District US Federal Court System, and Superior Court in Tel Aviv, Israel.

Mr. Sherman has developed training programs for newly assigned members of the Crime Scene Unit and provided comprehensive courses of academic instruction, practical training and mentoring for a number of junior members. While assigned to the Office of the Police Commissioner's Bio-Terrorism Task Force he provided assistance in the formulation of a tactical response protocol to bio-terrorism attacks and the instruction of first responders in these newly developed procedures.

Kenneth Eng – Latent Prints

Also a retired NYPD detective, Mr. Eng was assigned to the New York City Police Department's CIRP – Latent Print Unit for seventeen years as a detective, police officer and fingerprint technician. After his retirement, he was appointed as a fingerprint examiner with the Phoenix Police Department's Latent Comparative Section. Mr. Eng has performed his duties under an accredited quality assurance program which included annual proficiency testing, technical peer and administrative review and strict adherence to standard operating procedures.

Mr. Eng has been qualified as an expert in the science of latent print identification in hundreds of cases in district and superior courts in New York and Arizona. His responsibilities have included the examination and evaluation of evidence for latent prints for identification value, comparison of latent prints with the prints of known individuals, generation of reports based on results of findings and providing expert witness testimony as requested.

A number of additional forensic consultants are available the following:

- DNA analysis review and evaluation
- Forensic computer investigations and recovery
- Arson and explosion investigation