



Firearms

(Unit 6)



Modern firearms are manufactured in a variety of shapes and sizes to fit multiple purposes. There was a time when the forensic scientist was faced with a less complex situation, with fewer types, models, and merchants. Unfortunately, the popularity of firearms in this country includes not only a larger quantity of guns, but also a staggering array of models. These include semi-automatic and even automatic weapons built primarily for military usage. Virtually any type of gun can be found on the streets in use by youth gangs, persons involved in drug trafficking, "survivalists", and even what we would consider "ordinary" citizens.

Terminology

Due to the multiple types, purposes, and cultures that have developed around firearms, a language of its own has developed. Before discussing the forensics of firearms, one must have a grasp on the terminology associated with them. Some of these terms are slang, or have more than one meaning. In this chapter we will attempt to adhere to the use of the words most closely related to their professional use. See the end of this section for a review of the more common firearms terminology.

Handguns

From the very start, a handgun was conceived as a compact weapon for self defense. Even though today there are handguns made specifically for target competition and hunting, most are still designed with defense in mind. Thus, handguns are compact for concealment and ease of carrying. This becomes a part of the legal definition of a handgun, as they are considered "concealable" and therefore deemed dangerous and are controlled by law in most states. Of course, a handgun should be capable of firing a projectile accurately at a target. Different gun manufacturers produce many different models for many different purposes. Since no one can be guaranteed a perfect shot or a single attacker, a handgun must fire multiple shots. The two most common defensive handguns are the double action revolver and the semiautomatic pistol.



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Revolvers

The revolver, the first multiple shot hand gun, has several advantages and unique features. Importantly, they are less expensive, simpler in design, and more reliable than semiautomatics. A revolver is easy to use, even for novices. They are also relatively accurate. However, compared to semiautomatic weapons, revolvers are limited to six shots, relatively slow to reload, less efficient, and the trigger pull is more difficult.

Several common variations exist among common revolvers. If the *barrel* length is shorter, for ease of concealment, the gun becomes less accurate. If the barrel length is longer, the accuracy is much improved. An *ejector rod* under the barrel is used to eject fired cartridges from the open *cylinder* before reloading. The *sights*, which are lined up when aiming the weapon, on a revolver are usually a blade in the front and a notch on the rear. The *frame* is the largest part, and all other pieces attach to it. Frames are usually made of blued or plated steel, stainless steel, or lightweight alloys such as magnesium. A revolver may weigh as little as 1 lb or more than 4 lbs. The cylinder contains five or six holes for the cartridges and can be swung out for reloading. This must be performed manually; the absence of cartridge cases at a crime scene may indicate the use of a revolver.

On a revolver, there is a gap between the cylinder and barrel to allow the cylinder to turn freely, this also allows gases to escape laterally. Close range revolvers, may deposit gunshot residue on surrounding structures and allow the forensic pathologist to predict the location of a shooter more easily. The inner mechanics of a revolver uses the energy from a *trigger* pull to rotate the cylinder, cocking the weapon, and then fall the *hammer*.

Revolvers can have one of two distinct firing action designs. A *single-action* revolver, the oldest and simplest action, requires a shooter to cock the hammer back before each pull of the trigger. In this way, a single reaction weapon must be cocked before each round is fired and may not be fired as fast as other hand guns. In a *double-action* weapon, a trigger pull will cock the weapon manually and fire the gun; a shooter, if desiring a more careful aim, may still opt to manually cock the gun before firing it. Using the trigger pull to cock the gun is faster, but it requires quite a bit more pressure and may compromise accuracy.





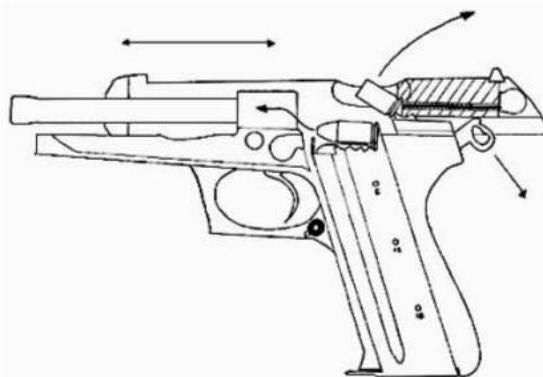
Semiautomatic Pistols

A more recent development than the revolver the pistol originated in the late 19th century. Almost every semiautomatic handgun available today is a copy of two basic designs: the Colt model 1911A government 45 and the Browning Hi Power 9 mm.

The advantages of semiautomatics stem from the use of recoil generated by the fired cartridge to eject the empty cartridge case, load the next cartridge, and cock the hammer. This is more conducive to firing multiple shots at multiple speeds. Many pistols are

designed to carry 15 to 19 rounds. This setup is also responsible for pistols' disadvantages. A more complicated mechanism requires more practice to use, and is more likely to malfunction. In addition, cartridge cases must be shorter to work well; because of this revolver cartridges are more powerful than semiautomatic cartridges.

The barrel on a pistol is normally hidden by the *slide*. Since the barrel must fit within the slide, choices of barrel length are limited. When the gun is fired, the slide is designed to move back along the axis of the barrel under tension from a spring. As the slide and empty cartridge case are sliding backwards, the case is struck by a stop that bumps it to the side. This is located next to a hole in the slide, so that the empty cartridge case is ejected from the pistol. An ejected cartridge may fly as much as 20 feet from a fired gun. The slide also cocks the hammer as it is sliding backwards. After the case is clear, the slide starts forward. While sliding forward, a spring in the *clip* pushes a column of cartridges against the bottom of the slide. As the slide returns to the column of cartridges, it grabs the one and pushes it forward and upward into the *chamber*.



The handle of a pistol is more important than that of a revolver because it contains the magazine, or clip, which holds the cartridges. Even on open ground ejected cases may be difficult to find, as they may roll into grass or small depressions in the ground. Therefore, ejected cases will virtually always be left behind at the scene and must be searched for diligently.

Rifles



Rifles differ from handguns in the length of the barrel and the presence of a butt stock. They are harder to carry, are poorly concealable, and more loosely regulated than handguns. However, they are much more accurate and shoot more powerful cartridges than handguns. This is evidenced by the larger amounts of powder present in a round. Rifles may be manufactured as single shot; but, most commonly rifles possess bolt action, like. Military rifles are semi-automatic or automatic, having a detachable magazine holding 5 to 50 rounds. Pump action and lever action rifles, usually of lower caliber, have magazines below the barrel.

Shotguns



Shotguns have a similar external appearance to rifles, but differ in the lack of rifling inside the barrel, which is the basis for their legal definition. A shotgun shell may contain one large projectile (called a slug), a few pellets of large shot, or many tiny pellets. Shotguns are available in single shot (break action), double barrel, pump action, and semiautomatic. Unlike rifled firearms, a shotgun has a smooth barrel. Therefore, it follows that projectiles passing through a shotgun barrel will not be impressed with any characteristic markings that can later be related back to the weapon.

The truly unique thing about shotguns stems from the *shot* that is projected from the barrel and the distribution *pattern* as it approaches a target. The original intent of such a design was to lesson the skill needed to shoot small moving food targets, such as birds and rabbits. Although these guns are still commonly used for such purposes, criminals, gangs, and even law enforcement have used these weapons on human targets. When the barrel of a shotgun is shortened past the legal limit of 18.5" it becomes a weapon capable of putting down multiple targets in a single shot. The shorting of the barrel causes the shot to spread out quickly and in a wide pattern, thus allowing for multiple hits on wide latitude. For this reason *sawed off* shot guns may be used by law enforcement to subdue a mob or by gang members to inflict injury on a rival gang.

Other Firearms



Single shot weapons are exactly what they appear. These weapons hold a single round in barrel and must be reloaded after each shot. These weapons are extremely simple in comparison to the other classes, but because of their simplicity and dependability, they are still very common. These designs lend themselves to the abilities to improve accuracy and range. For some weapons, a barrel change offers an alteration in accuracy, distance, conceal ability, or even type of ammunition discharged.

Derringers are handguns which seem to be designed for the specific purpose of ease of concealment. The bottom gun in the picture above is a double barrel derringer. Derringer is actually the name of a company who was once the most popular of these types of guns. In fact any gun which tends to be small and concealable is called a Derringer, regardless of the manufacturer. Such weapons may be single shots, double barrels, revolvers, or pistols. There are even several Derringers on the market which do not fit well in to any of these specific classes. All however, as modeled in many old style western poker matches, are small and extremely easy to conceal.



Handguns are the choice weapon in more than 90% of firearms crime. Rifles and shotguns are familiar to most Americans because of their popularity for hunting. There are thousands of different types of these and other guns. Any of these weapons can and are used in crimes. It would be futile to attempt an explanation of all the different types of weapons. There are however, a significant number of crimes associated with assault weapons and automatic weapons to warrant a short discussion of each.

Automatic weapons are those weapons which will fire repeated rounds when the trigger is pulled and held. This allows the weapon to fire, reload and fire again as fast as the gun can possibly move. The most widely know automatic weapons are machine guns. Most of these weapons are not legal, for personal use. It is possible for a skilled gunsmith to convert a semi-automatic into a fully automatic weapon. The procedure is not legal, but is often performed on guns to make them more deadly. Semiautomatic versions of submachine guns (such as the Uzi) are classed as pistols for legal reasons. These often have the ability to hold 20 to 30 rounds, but because they require independent trigger pulls for firing, they are not illegal. The expense of such weapons precludes their use by most criminals, but they may be used by persons involved in organized crime, drug-dealing, and gangs.

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Snub nose revolvers are common types of revolvers which have a shorter barrel (a snub nose) than normal revolvers. The shorter barrel on these weapons results in a less accurate weapon, but one that is much easier to conceal. Many women buy snub nose revolvers for the purse. Additionally, a snub nose is often the backup weapon of choice for many law enforcement officials.



Assault weapons are those weapons designed to kill mass numbers of people at a time. The classification includes automatic weapons, machine guns, sawed off shotguns, grenade launchers, and many other weapons used by the military.

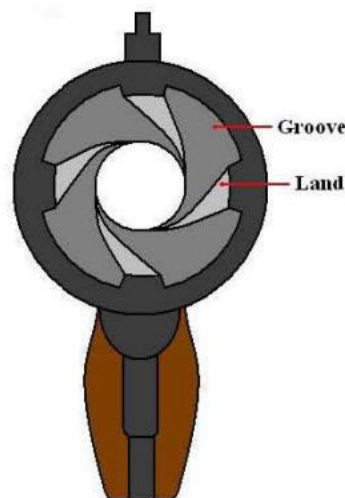


Saturday Night Special. The price of firearms varies greatly depending on quality, local laws, and availability, but "Saturday night specials" are readily available to basically anyone. A Saturday night special is a weapon, usually a low quality hand gun, purchased for a small amount of money with intent to kill someone and then dispose of the weapon. The origin of the name likely comes from the frequency of killings that continue to occur on weekend nights in the urban areas. There tends to be more drinking, drug use and shootings on week-ends and more often than not, the weapons used are not high quality. Most of these weapons are bought on the black market (illegally).

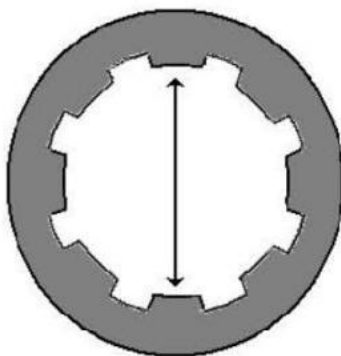


Rifling

In modern times, each barrel is produced from a solid bar of steel that is hollowed out by drilling. Drill marks left on the inner surface of each barrel are randomly irregular and in themselves cause a uniqueness to each barrel. In addition, the manufacturer then cuts its own specific design of spiral *grooves* onto the inner surface of each barrel. This step is known as *rifling*. The surfaces of the original barrel remaining between the grooves are called *lands* (see figure right). A bullet traveling through the barrel engages the grooves, which guide the bullet through the barrel. The bullet then spirals, much like a well thrown football, through the air. The result of such a spin is a more straight and accurate shot. While most weapons have rifling, shot guns and authentic muzzle loaders do not. The small pellets shot from a shot gun would not be affected by rifling and muzzle loaders are reminiscent of a time before rifling was utilized.



Caliber and Gauge



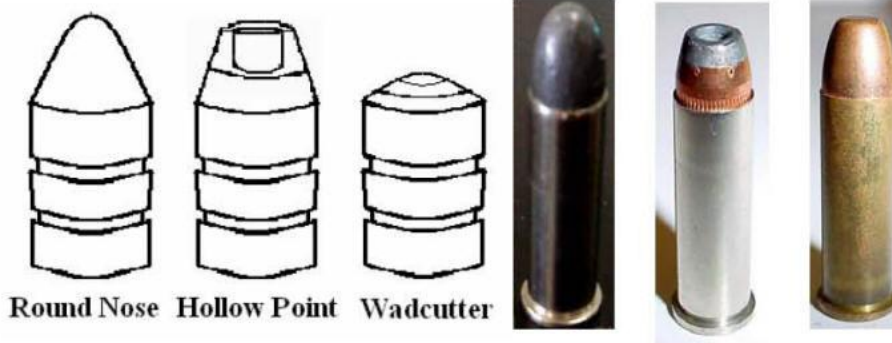
Rifles and hand guns are classified by their caliber. The diameter of a gun barrel measured between opposite lands is known as the *caliber* (see diagram to the left). In most situations, caliber is measured in hundredths of an inch or in millimeters, for example, .22, .38, and 9 mm. Actually, the term caliber, as it is commonly applied, is not an exact measurement of the barrel's diameter; for example, a 38 (.38 inches) caliber weapon might actually have a bore diameter that ranges from 0.345 to 0.365 inches. Notice that a 357 (.357 inches) lies within this range. Although a 38 and a 357 may be two different guns, in actuality they have the same barrel size.

Every firearms manufacturer chooses a rifling process that is best suited to its product. Once the choice is made, the class characteristics of the weapon's barrel will remain consistent; each will have the same number of lands and grooves, with the same approximate width and direction of twist. For example, .32 caliber Smith & Wesson revolvers have five lands and grooves twisting to the right. On the other hand, a Colt .32 caliber revolver exhibits six lands and grooves twisting to the left. Although these characteristics may be of some value in permitting an examiner to distinguish one type or brand of weapon from another, alone they can not identify an individual firearm.

Instead of caliber, shotguns are identified by *gauge*. The higher the gauge, the smaller the barrel's diameter; the barrel of a 10-gauge shotgun has a larger diameter than that of a 12 gauge. The exception to this rule is the "four-ten" shotgun. Similar to caliber a four-ten has a barrel diameter of .410 inches. The term gauge refers to the number of lead balls with the same diameter as the barrel that would make a pound. That is a 12-gauge shotgun is one having an inside diameter equal to the diameter of a lead ball that weighs 1/12 of a pound. Shotgun rounds may also be equipped with a single projectile. These are called slugs.

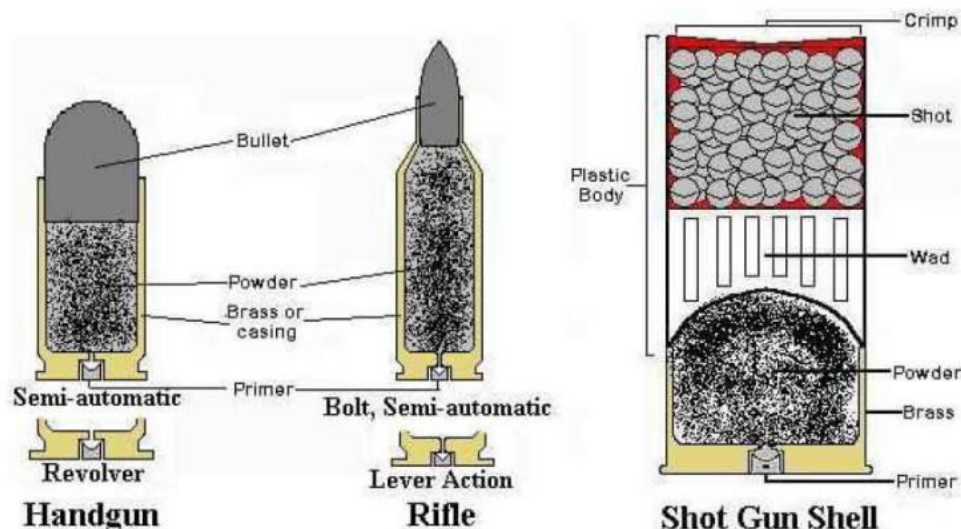
Firearm Terminology

- **Action:** the part of a firearm that loads, fires, and ejects a cartridge. Includes lever action, pump action, bolt action, and semi-automatic. The first three are found in weapons that fire a single shot. Firearms that can shoot multiple rounds ("repeaters") include all these types of actions, but only the semi-automatic does not require manual operation between rounds. A truly "automatic" action is found on a machine gun.
- **Barrel:** the metal tube through which the bullet is fired.
- **Black Powder:** the old form of gunpowder invented over a thousand years ago and consisting of nitrate, charcoal, and sulfur.
- **Bore:** the inside of the barrel. "Smoothbore" weapons (typically shotguns) have no rifling. Most handguns and rifles have "rifling".
- **Breech:** the end of the barrel attached to the action.
- **Butt or stock:** the portion of the gun, which is held or shouldered.
- **Bullets:** the projectile. They are shaped or composed differently for a variety of purposes.
 - "round-nose" - the end of the bullet is round.
 - "hollow-point" - there is a hole in the bullet that creates expansion when a target is struck, creating more damage.
 - "1/2 jacketed" - the soft lead is partially surrounded by another metal, usually copper, that promotes exit velocity.
 - "jacketed" - the soft lead is surrounded by another metal, usually copper, that allows the bullet to penetrate a target more easily.
 - "wad cutter" - the front of the bullet is flattened. Used mainly for target practice.



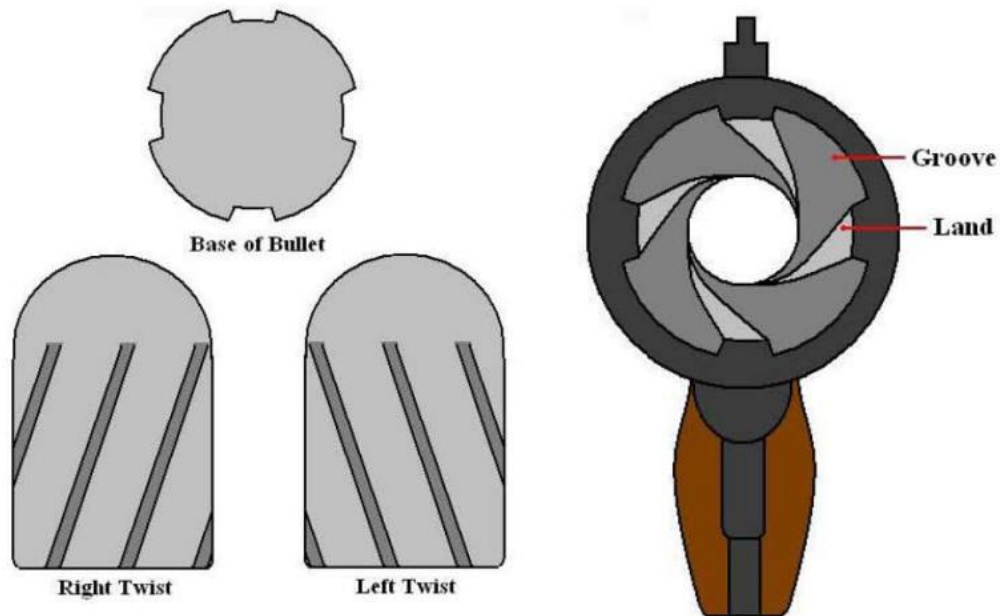
- **Caliber:** the diameter of the bore measured from land to land, usually expressed in hundredths of an inch (.22 cal) or in millimeters (9mm).

- **Cartridge:** also called a "round," "ammunition," or "shell". Made up of a case, primer, powder, and bullet.



- **Centerfire:** the cartridge contains the primer in the center of the base, where it can be struck by the firing pin of the action (most commonly on a 22).
- **Chamber:** the portion of the "action" that holds the cartridge ready for firing.
- **Choke:** a constriction of a shotgun bore at the muzzle that determines the pattern of the fired shot.
- **Double-action:** pulling the trigger both cocks the hammer and fires the gun.
- **Double barrel:** two barrels side by side or one on top of the other, usually on a shotgun.
- **Gauge:** refers to the diameter of the barrel on a shotgun, in terms of the number of lead balls the size of the bore it would take to weigh one pound (10 gauge, 12 gauge, etc.)
- **Hammer:** a metal rod or plate that strikes the cartridge primer to detonate the powder.
- **Ignition:** the way in which powder is ignited. Old muzzle-loading weapons used flintlock or percussion caps. Modern guns use "primers" that are "rimfire" or "centerfire"

Lands and grooves: lands are the metal inside the barrel left after the spiral grooves are cut to produce the rifling.



- **Magazine:** a device for storing cartridges in a repeating firearm for loading into the chamber. Also referred to as a "clip"
- **Magnum:** an improved version of a standard cartridge which uses the same caliber and bullet, but has more powder, giving the fired bullet more energy. Magnum shotgun loads, however, refer to an increased amount of shot pellets in the shell.
- **Muzzle:** the end of the barrel out of which the bullet exits.
- **Pistol:** synonym for a handgun that does not have a revolving cylinder.



- **Powder:** modern gun cartridges use "smokeless" powder that is relatively stable, of uniform quality, and leaves little residue when ignited.
- **Primer:** a volatile substance that ignites when struck to detonate the powder in a cartridge.

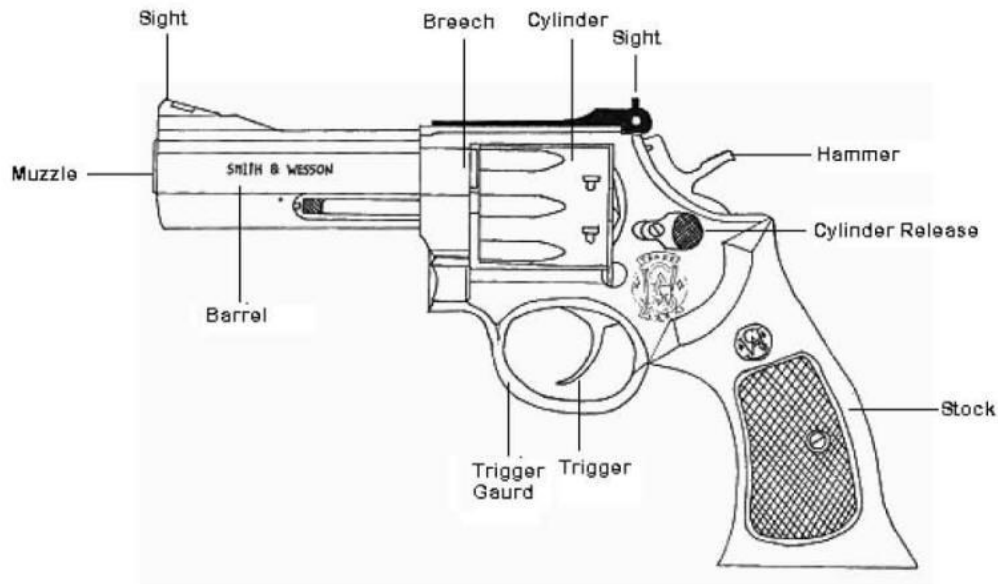
- **Revolver:** handgun that has a cylinder with holes to contain the cartridges. The cylinder revolves to bring the cartridge into position to be fired. It is "single-action" when the hammer must be cocked before the trigger can fire the weapon. It is "double-action" when pulling the trigger both cocks and fires the gun.



- **Rifling:** the spiral grooves cut inside a gun barrel that gives the bullet a spinning motion.
- **Rimfire:** a cartridge with the primer distributed around the periphery of the base.
- **Safety:** a mechanism to prevent firing of the gun.
- **Shotgun:** a gun with a smoothbore that shoots cartridges that contain "shot" or small metal pellets (of lead or steel) as the projectiles.
- **Sights:** the device(s) on top of a barrel that allow the gun to be aimed.
- **Silencer:** a device that fits over the muzzle of the barrel to muffle the sound of a gunshot. Most work by baffling the escape of gases.
- **Single-action:** the hammer must be manually cocked before the trigger can be pulled.
- **Smokeless powder:** refers to modern gunpowder, which is really not "powder" but flakes of nitrocellulose and other substances. Not really "smokeless" but much less so than black powder.
- **Stock:** a wood, metal, or plastic frame that holds the barrel and action and allows the gun to be held firmly.

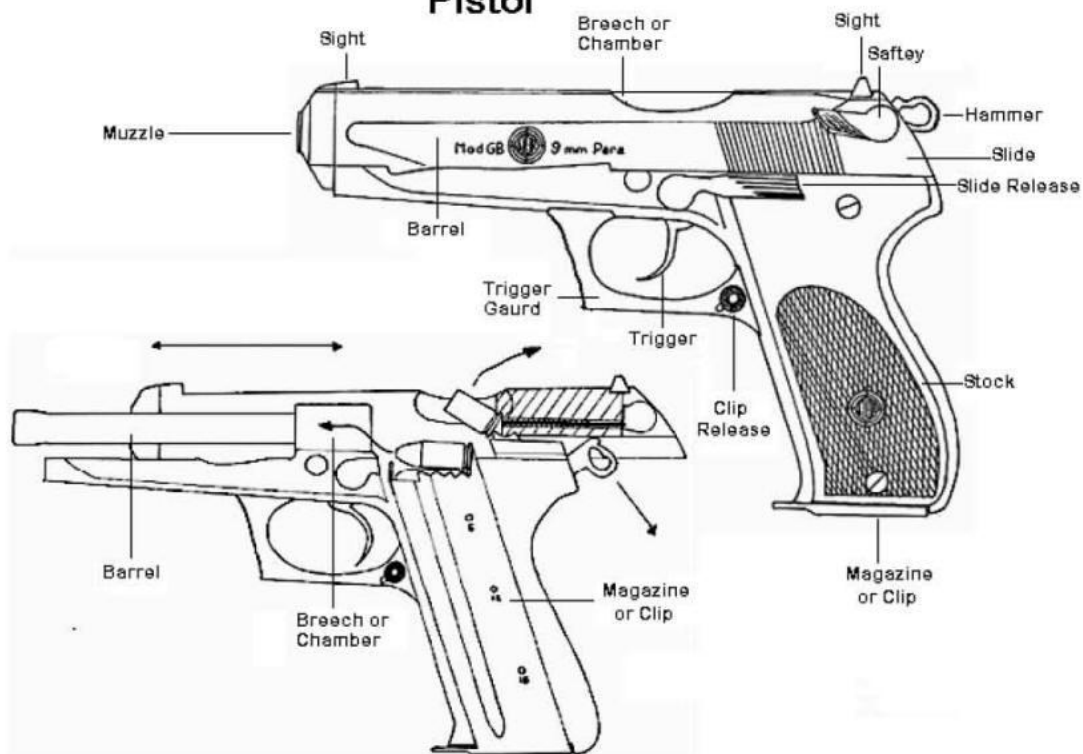
Handgun Diagrams

Revolver



This gun does not have a saftey

Pistol



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