**FORENSIC BALLISTICS**

**Answer all questions neatly and clearly in your workbook.**

When a forensic investigation involves a shooting, ballistics becomes an important facet of the investigation. Ballistics is a term that refers to the science of the flight path of a bullet. The flight path includes the movement of the bullet down the barrel of the firearm following detonation and its path through both the air and the target.

1. What is ballistics?
2. What is the flight path?

Tracing the path of a bullet is important in a forensic examination. It can reveal from what direction the bullet was fired, which can be vital in corroborating the course of events in the crime or accident.

1. What trace the flight path?

It is an obvious truism that the distance that a bullet can travel depends on its speed. A higher speed imparts more energy to the bullet. The frictional resistance of the air and the downward pull of gravity will take longer to slow the bullet's flight, as compared to a bullet moving at a lower initial velocity.

1. What is resistance?
2. How do you calculate the speed of an object?

Generally, a bullet fired from a rifle will carry more energy than a bullet fired from a handgun. This is because the stronger firing chamber of a rifle is able to withstand the increased explosive power of a larger quantity of powder that would likely rupture the barrel of the handgun. Detonation of the powder in a rifle or handgun supplies the thrust to propel the bullet down the barrel.

1. Draw a diagram explaining parts of a handgun and rifle. Label the firing chamber.

Expansion of the exploding gunpowder generates pressure, which is measured as the force of the explosion that pushes on the area of the bullet's base. This area is essentially the diameter of the barrel of the firearm, which remains constant. Thus, the explosive energy that passes to the bullet depends on the mass of the bullet multiplied by the force of the explosion multiplied by the time that the force is applied (i.e., the time the bullet is in the barrel). A longer barrel will produce a faster moving bullet.

1. Which type of barrel produces the faster moving bullet?

Once a bullet leaves the rifle or gun barrel, the aforementioned frictional and gravitational forces begin to slow its speed, producing a downward arc of flight. The frictional force is affected by the bullet's shape. A blunt shape will present more surface area to the air than will a very pointed bullet.

1. What is the difference between frictional and gravitational forces?
2. How does the bullet shape affect speed?

Another factor that affects the flight of a bullet is called yaw. As in an orbiting spacecraft or a football tossed through the air, yaw causes a bullet to turn sideways or tumble in flight. This behaviour is decreased when the object spins as it moves forward (the spiralling motion of a football). The barrel of a rifle or gun contains grooves that cause the bullet to spin. More damage results from a bullet that is tumbling rather than moving in a tight spiral.

1. What is a yaw?
2. How does it affect motion?

The composition of a bullet is also important. Lead is commonly used to form the core of bullets. However, because it tends to deform, the blending in of other metals (typically antimony and copper) produces a bullet that can withstand the pressure of flight and impart high energy to the target upon impact.

1. What difference does the composition of the bullet make?

Copper is often used to jacket the inner lead core of a bullet. However, some bullets are deliberately made without this full metal jacket. Instead, the bullet has a tip made of lead or a tip that is hollow or very blunt. These bullets deform and break apart on impact, producing more damage to the target than is produced by a single piece of metal. This is because the bullet's energy is dissipated within a very short distance in the tissue.

1. Why would copper not be used in bullets?

Forensic and medical examiners are able to assess the nature of tissue damage in a victim and gain an understanding of the nature of the bullet used.

A bullet produces tissue damage in three ways. First, a bullet can shred (lacerate) or crush tissue or bone. Bullets moving at relatively low velocity do most of their damage this way. Fragmentation of bone can cause further damage, as the bone shards themselves become missiles.

1. How do bullets damage tissues?

The second form of damage is known as cavitation. This damage is produced by the forward movement of air or tissue in the wake of the bullet. The wound that is produced by the bullet is destructively broadened by the force of the moving air or tissue. In a tissue, this produces even more structural damage.

1. Explain cavitation?

Third, the air at the front and sides of a very fast moving bullet can become compressed. The explosive relaxation of the compression generates a damaging shock wave that can be several hundred atmospheres in pressure. Fluid-filled organs such as the bladder, heart, and bowel can be burst by the pressure.

1. What is compression?
2. How does it affect fluid filled organs?

Recovery of bullets can be a very useful part of forensic ballistics. A variety of bullet designs exist, some that are specific to the firearm. Furthermore, the scouring of a bullet's surface as it encounters the grooves of the firearm barrel can produce a distinctive pattern that enables a bullet to be matched with the firearm. A weapon recovered from a suspect can be test fired and the bullet pattern compared with a bullet recovered from the scene to either implicate or dismiss involvement of the firearm in the crime.

1. Why are bullets and firearms important in forensic evidence?

This aspect of ballistics was crucial in convicting John Allen Muhammad and John Lee Malvo of the 10 sniper murders and the wounding of three others in the Washington, D.C. area that occurred during three weeks in October of 2002.

Q. What is ballistics?

A. Ballistics is the science of a projectile and the path it takes from start to finish.

Q. What is Forensic ballistics?

A. It is the science of a bullet being traced to a gun, then investigators try, to figure out how it was used. Forensic ballistics experts analyze bullets, bullet holes, bullet cartridges , and how it gets in some one’s body. They also look at gunshot residue and parts of a gun. Forensic ballistic investigators play one of the most important roles in crime scene investigations. You may find an investigator at the FBI, SS, CIA, DEA, Army, Navy, Air force, Marines, and U.S Department of Justice.

When investigators are at a crime scene the most important evidence is finding a bullet. Inside the barrel of pistols and rifles are grooves. They have grooves because it causes the bullet to spin more and be more accurate. Hand gun bullets have certain marks that match the grooves in the barrel of the gun. This helps investigators because it’s easy for them to figure out the marks on the bullet since it matches the grooves of the barrel.

Each one has its own one of a kind finger print called ballistic fingerprint. Another piece of evidence are casings. Inside casings is the gun powder and the bullet. When a gun is fired the firing pin hit the casing then ignites the gun powder which lets the bullet out. Gun shot residue and the shell also come out.

The casings also leave evidence by markings. The markings are made by the firing pin and the grooves from the gun barrel.

Investigators don’t normally use gun powder residue to identify a type of gun. They use it for other things. Gun powder on a victim’s body can tell how far apart they were. If gun powder residue on the ground you could tell where the shooter was standing and where it was shot. If residue was on the suspect’s body it can link them to the crime.

There is a very long history to ballistics. Did you know gun powder was invented in china in the 9th century?

Gun powder was used for fireworks in the beginning. Soon, the armies learned that it was good to launch weapons. In the 1300's the Chinese invented the first gun called a musket.  
When a musket was fired, the shooter had to put a wad of paper above the gun powder and bullet. In one crime from 1794, a victim was shot and when the doctor was inspecting the victim, he found a bullet and paper inside the man. The suspect who was arrested was John Toms. Inside John's pocket was a ripped piece of paper.  
The paper in the victim's body matched John's. Another famous case was the St. Valentine's Day massacre. This is another crime solved with forensic science ballistics.  
On February 14, 1929 five members of Al Capone's gang arrived at the S.M.C. cartage company warehouse. Three of Capone's men wore police suits, the other two were in plain clothes. Inside the warehouse were six members of George Moran's gang. Al Capone's men pretended to arrest Moran's men and told them to line up against the wall. Capone's men opened fire on Moran's men and killed them. When they left, the two plainclothes men had their hands up, pretending to be arrested as they were followed  
by the other three in police uniforms. They took off in a patrol car to make it look like an arrest. Many people in Chicago thought the police were responsible for the killings. Ballistics investigator Calvin Goddard was brought in to check the evidence.  
Goddard began test firing the police guns. None of the bullets and casings from the crime matched the police weapons. A few months later, police raided the home of Fred Burke and found a stash of weapons. Two of Burke's machine guns were matched to  
bullets and shells. The crime was solved!  
As you can see, forensic ballistics has played an important part in solving crimes in the past two hundred years. Including some of the most famous crimes ever, like the St. Valentine's Day Massacre. Forensic ballistics is more important today than ever  
before. Crimes that are nearly impossible to solve are a lot easier with forensic ballistics.

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