**External Ballistics: Influence on Trajectory**

1. **Spin / twist**

The spin of the bullet is its revolving (gyration) around its longitudinal axis. The speed of spin is varied by varying the twist (i.e., the degree of turning) of rifling.

1. **Drift :**

Spinning has improved both the range and the aim of the firearm, it has also introduced drift. Drift is side way shift of the projectile from the plane of departure. It takes the direction of the spin.

1. **Yaw**

When bullet travels on a parabolic way, vacuum is created on the base of the bullet so it deviates from its nose-on position forming yaw. Yaw angle is the angle made to the axis due to tangent drawn to the trajectory due to deflection of projectile.

1. **Base drag**

As vacuum is created at the base of the bullet air pulls it to the rear side. This backward pulling of the bullet is called base drag.

1. **Ricochet**

It is the shifting of bullet direction when the bullet strike appropriate solid target and moves in different direction due to low elevation angle. If surface is hard then projectile may rebound. It can be seen as, heavy projectiles moving at a moderate velocity deflecting their path. Steel shotgun pellets are more prone to ricochet.

 It can be examined as-

* bullets- they are examined under stereomicroscope for any damage
* Scene of occurrence- the surface is looked on which mark of bullet strike may be present.
1. **Structure of projectile**

The structural aspects of the projectile have a profound effect on the trajectory because certain shapes overcome air resistance better than the other.

The problem of base drag is overcome in boat tailed and stream lined bullets.

The air resistance is the most important retarding force acting on a moving projectile. It is directly proportional to head area (projection area) which comes against the air. The lesser the area, the lesser is the air resistance and longer will be the trajectory. The spitzer bullets become common and popular because of their pointed nose.

1. **Air resistance**

 Air resistance affects the trajectory of the projectile in two ways:

 1. It retards the velocity of the projectile thus, decreasing the range.

 2. The wind tends to push the projectile in the direction it is blowing.

1. **Retardation**

 The retardation in air depends upon :

 1. The velocity of the projectile

 2. The shape of the projectile

 3. The density of air

 4. The temperature of atmosphere