CHAPTER III

THE INTEGRATED ACT OF FIRING

A. GENERAL. In this chapter we are going to consider several of the factors that must be integrated to produce the total act of firing a shot. The reader should bear in mind that we consider each factor separately only for ease of discussion. All converge and are coordinated at a single moment to produce the shot.

1. To the spectator, the performance of a shooter appears deceptively simple; the shooter places the rifle in position, takes aim, and pulls the trigger.

2. But the man behind the rifle knows differently. Shooting is not simple; it involves a complex coordination of several mind and body functions.

B. SHOOTING METHOD. It is relatively easy to talk or write about correct shooting methods. To put these methods into practice is vastly more difficult. It is because of this challenge that shooting fascinates so many thousands of people.

1. The shooting method USAMKTU shooters accept is that of holding the rifle in the 10-ring and activating the trigger without disturbing the rifle. This method requires the shooter to develop his ability to hold the rifle motionless.

2. The other method is to allow the rifle to move about on the target, and fire the shot as the rifle crosses the 10-ring. This method of "shooting on the move" has a definite disadvantage in that the shooter cannot always predict the precise path of the rifle's movement. He will therefore never completely eliminate wild shots.

C. BREATH CONTROL.

1. General. The breathing process provides the body with oxygen and eliminates waste elements from the blood. Correct breathing is essential to proper body function.

2. A complete respiratory cycle lasts 4-5 seconds. Inhalation and exhalation require only about 2 seconds. Thus between each respiratory cycle there is a pause of 2-3 seconds. This pause can be extended to 6-8 seconds without any special labor or unpleasant sensations. It is during an extended pause between breaths that the rifleman should fire the shot. (Figure 14) The reason being that during the respiratory pause the breathing muscles are relaxed and the shooter avoids strain upon the diaphragm. Also his concentration is not broken by thinking of the need to breathe.

3. Holding the Breath.

a. When a beginning shooter is told that holding his breath will assist in steadying the rifle, he may instinctively relate this action to holding his breath in the manner that he would prior to submerging in water. Inhaling deeply and holding the air in the lungs is NOT a correct procedure in marksmanship.

b. A shooter should assume his position and breathe naturally until his hold begins to settle. He then takes a slightly deeper breath; exhales and pauses, expecting to fire the shot during the pause. If the hold does not settle sufficiently to allow the shot to be fired, the shooter resumes normal breathing and repeats the process. The technique is graphically portrayed below.

4. The respiratory pause should never feel unnatural. If the pause is extended for too long a period, the body suffers from oxygen deficiency and sends out signals to resume breathing. These signals produce slight involuntary movements in the diaphragm and interfere with the shooter's ability to concentrate. Generally speaking, 6-8 seconds is the maximum safe period for the respiratory pause to fire a shot.

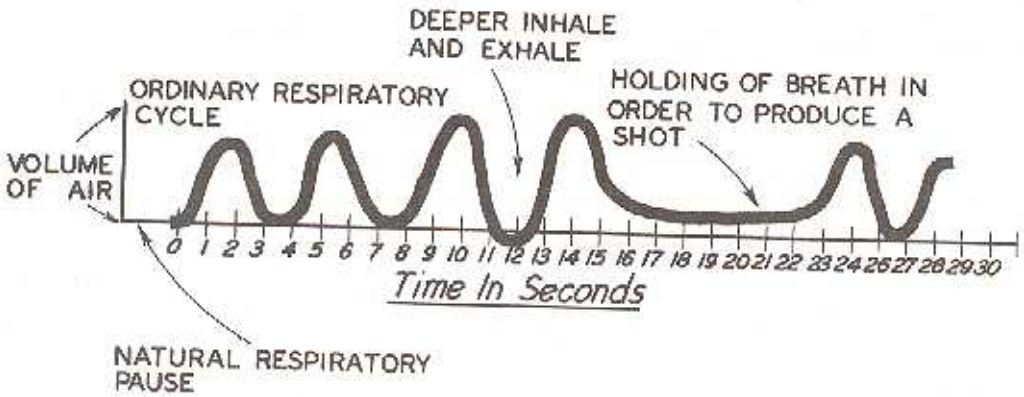


Figure 14. The respiratory cycle.

D. THE EYE AND THE SIGHT SYSTEM.

1. General. The shooter need not concern himself with a scientific knowledge of the eye. He should be concerned only that his eyes are healthy, that he can see clearly, and that he uses his eyes properly while shooting. A layman should never attempt to prescribe or administer treatment to defective or injured eyes. A shooter (or anyone) with eye problems should consult a vision specialist. Corrective lenses in no way impair a shooter's ability. Some of the world's best marksmen shoot with corrected vision.

2. The Human Eye.

a. A person with no eye defects normally has 20/20 vision. "Twenty/twenty" does not denote "perfect" vision. It is simply an arbitary standard of measurement applied to visual acuity. It denotes the ability to read alphabetical letters 8.7 millimeters high at twenty feet. This constitutes reading letters contained within 5 minutes of angle. There are many cases of individuals being able to read within 3 minutes of angle, and in some cases, within less than 2 minutes of angle. Weak or defective eyes can in most cases be corrected to 20/20 strength by prescription lenses.

b. Human eyes are as different from one another as, say, human hands. This is true even of eyes that score 20/20 vision. Some eyes see sight pictures best in brilliant light. Others perform best in soft light. Some eyes have great perception of depth and perspective. Others do not. The list of differing characteristics could be made quite long. The important consideration is that two different people are likely to have different eye characteristics, even if they have 20/20 vision. A particular set of sights that provides maximum clarity to one shooter's eyes may not provide the same clarity to another shooter's eyes. Each shooter must select the components of his sight system to fit the characteristics of his own eyes. This rarely involves the purchase of special equipment.

3. Proper Use of the Eyes. While shooting, an individual should remember the cardinal principles in the proper use of his eyes:

a. Look as straight forward as possible out of the eye socket. If the head position causes the shooter to look across the bridge of his nose or out from under his eyebrow, the eye muscles will be strained. This strain will produce involuntary eye movements which reduce the reliability of vision. This will not only affect performance, but the inability to see well will also have a damaging psychological effect upon the shooter (see Chapter II, COACHING). The eyes will function best in their natural, forward-looking position.

b. Do not fix vision on the sight picture for more than several seconds. When the eyes are focused on a single image for a time, the image is "burned" into the area of perception. This effect upon the shooter's eyes is quite important. A burned in sight picture will dull acuity in the critical area of perception; and this image may possibly be mistaken for a true sight picture. Either effect will seriously damage performance.

c. Normally the best use of the eyes is derived when the shooter keeps both eyes open while firing. It is natural for the eyes to work as a refined team. If one eye is squinted or closed the other eye will have a tendency to want to do the same. With both eyes open the shooter also finds it easier to check the wind flags on the range while the rifle is in the aiming position.

d. On occasion there will be a shooter whose aiming eye is not his dominant eye. In this case it might prove helpful to use a blinder. In fact, most shooters do use a blinder regardless of their dominant eye. This tends to decrease visual distractions and increase concentration. Side lighting may also be distracting to the shooter under some light conditions. If harsh light becomes annoying, a blinder may be used here again. Such a blinder may be attached to the shooting glasses or hat brim. The preferred blinder is one that is attached to the rifle in the vicinity of the rear sight. In this manner, the left eye will remain open but the blinder will block out the view down range.

4. Focus of the Eye.

a. Many shooters contend that the shooter should focus his shooting eye on the front sight; that seeing the front sight or aperture clearly and distinctly is the most important visual aspect in sighting. This is not necessarily true. Most shooters have the capability of seeing both the front and target bull with equal clarity. This capability is referred to as "accommodation." When aiming the shooters eye is continuously changing focus from the front sight to the target and back to the front sight. The eye focuses back and forth so rapidly that it appears to the shooter that both images are seen with equal clarity.

b. However, after the age of 40-45 years the eye muscles lose their ability to flick back and forth at the rapid rate required to accommodate both the front sight and target bull. In such a case focus should be concentrated on the front aperture to obtain optimum results in sighting. This will result in the target being somewhat out of focus.

c. Accommodation and visual clarity can be improved by the use of a small rear aperture. A small rear aperture will increase depth of field, enhance accommodation and actually increase visual acuity. For this advantage to be realized the rear aperture must be smaller than the pupil of the eye. The smaller the rear aperture the greater the depth of field and the greater the visual acuity becomes. There is however, a point of diminishing returns regarding aperture size. When rear aperture size becomes less than approximately one millimeter an inadequate amount of light reaches the eye and vision becomes noticeably poorer.

5. The Sight System.

a. Proper sight alignment can be defined as the process of perfectly centering the front sight in the rear aperture.

b. Sight picture contains the same two elements of sight alignment (front and rear sights) with the addition of the bull or target image. A perfect sight picture exists when the sights are properly aligned and the bullseye centered in the front aperture or properly positioned on the post.

6. The Front Sight: The universally accepted front sight consists of a tublar mount containing a removable insert (Figure 15). The most frequently used inserts are the post and the aperture.

a. The Aperture: The aperture is the more popular insert. The most common error is the use of an aperture that is too small. Generally speaking, the diameter of the aperture should appear to be about 1 - 1 1/2 times the diameter of the target black. However, this is only a guide. The optimum size aperture is the one that reveals a wide line of white around the bull's-eye and allows the target to stand out in clear definition against this white background. The optimum size will change under different conditions of light. An aperture selected under one light condition might under a different light, form a blur around the target or make the target appear indistinct or oblong. A different aperture size will help to correct these aberrations. Each shooter must select the aperture size that meets the requirements of his own eyes under the prevailing light conditions.

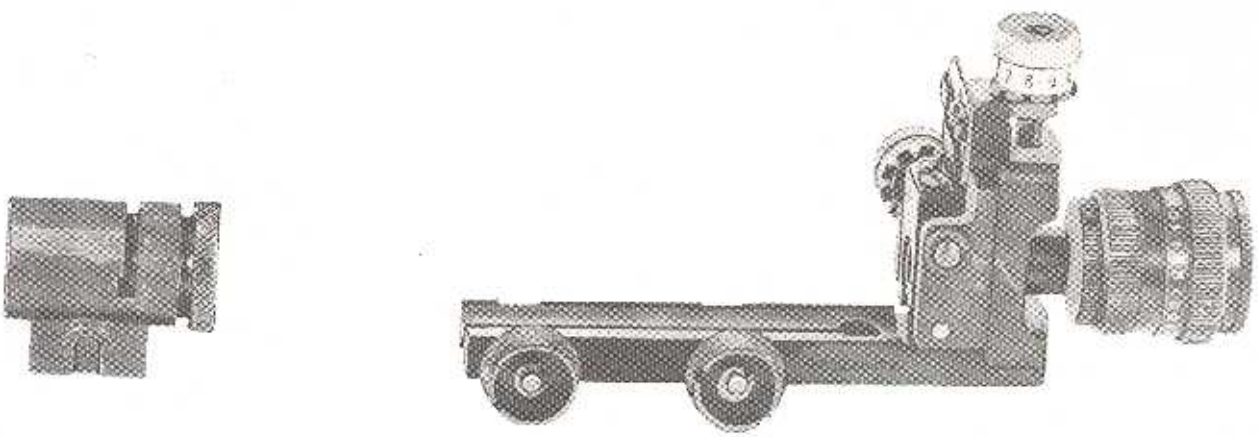


Figure 15. Front and rear sights with adjustable rear aperture.

b. The Post: The post should appear to be the same width as the black portion of the target. The post should approach the target from 6 o'clock. If the rifle is canted, the insert should be altered to compensate for the angle of cant so that the post still approaches the bull's-eye from 6 o'clock. There are two methods of using the post: (1) the 6 o'clock tangent hold, in which the bull's-eye appears to rest on the top of the post; and (2) the 6 o'clock line - of - white hold, in which a narrow line of white is visible between the top of the post and the bottom of the bull's-eye. Both methods are in general use, and the choice of method should be based on individual preference. The target and line-of white methods both require extremely keen eyesight. Most good shooters who use a post have better than 20/20 vision (natural or corrected) and a shooter should consider his visual acuity in making a choice between aperture and post.

c. The Disc: The disc insert has become popular with some shooters. The insert consists of a clear or translucent plastic disc with a center aperture. These discs come in various colors. The disc should conform to the same general standards applied to the metallic aperture. The opening in the disc should be round, clearly defined and easily visible. It should reveal a maximum contrast of the target black against the background. If a shooter prefers a disc aperture and achieves good results with one, there is no reason why he should not use it.

d. Combinations of Inserts: There is no indication that combinations of the above sight inserts contribute to a better mechanical sight system. The shooter may use a combination because of preference; but by all indications, he is only adding to the amount of equipment he must care for and gains nothing in terms of mechanical advantage.

7. The Rear Sight.

a. Mechanically, the rear sight should be rugged, tight, and firmly attached. It should be capable of finely graduated adjustments (1/4 or 1/8 minutes of angle). The adjustment mechanism should be free of slack and should move precisely the same distance with each click of adjustment. The sights should be protected at all times, but especially when being transported.

b. The rear aperture size should be selected to create a clearly defined sight picture and allow easy sight alignment.

c. Most shooters feel that a tight rear aperture (one that allows only a narrow line of white to be visible around the front sight hood) provides for the easiest sight alignment. Slight deviations in alignment are easily noticeable, and sight alignment becomes practically automatic. This line of white around the front sight hood can also be varied by increasing or decreasing the eye relief.

d. Some shooters prefer a large rear aperture (one that allows a wide line of white to be visible around the front sight hood). The large aperture can produce good results. However, because of the large area visible around the front sight, misalignment of the sights is less noticeable. The shooter must therefore consciously watch for errors in alignment. The tight aperture takes greater advantage of the mechanical system in providing for easy alignment.

e. The most important consideration in choosing a rear aperture is visual clarity. By adjusting the size of the rear aperture, the shooter can control the amount of light entering the eye. He can thus affect contrast in the sight picture, or contrast between the target black and white background. Strong contrast and sharp, clearly defined edges are desirable. While this is in part controlled by front sight aperture size (but not by post size), the size of the rear aperture is more critical in controlling definition.

f. We strongly recommend the use of an adjustable rear aperture (Figure 15).

8. Eye Relief. Eye relief is the distance between the eye and the rear sight (Figure 16). There is no measured distance that is correct eye relief for all shooters. In many cases it is controlled by the construction of the equipment. Eye relief can best be evaluated by these two standards.

a. The position of the sight should result in the shooter assuming a natural upright position. The sight should be adjusted to the head position, and not the head position to the sight. The importance of head position is discussed in Chapter IV, INTERRELATED ASPECTS OF POSITION SHOOTING.

b. Eye relief should feel comfortable to the shooter. The rear sight should not be so close that the shooter worries about recoil; and it should not be so far from the eye that he must strain to receive a clear sight picture. Some shooters prefer close eye relief, others distant relief. Average eye relief is about 2-6 inches. Each shooter must adjust eye relief to fit his own eye characteristics.

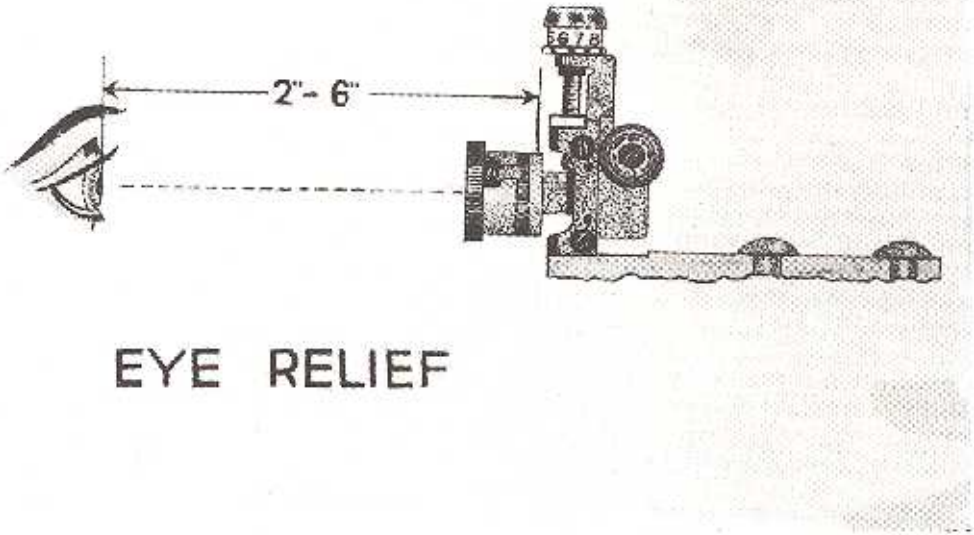


Figure 16. Eye relief.

E. TRIGGER CONTROL. The progressing shooter will at first give a great deal of attention to trigger control. Experienced shooters will also have difficulty from time to time. By making a repeated effort to develop a correct trigger pull, the pull itself will require less and less conscious effort and will eventually assume reflex characteristics.

1. Activating the Trigger.

a. Reflex Action: The awareness of body control will include an awareness of trigger control. However, the shooter can develop his trigger control to the point that activating the trigger requires no conscious effort. He will be aware of the movement, but he will not be consciously directing it. Everyone exhibits this type of reflex activity in daily living. The individual who walks or drives a car while carrying on a conversation is an example. He is aware of his muscular activity, but not "planning" it. He is thinking about the conversation.

b. A closer analogy to shooting is found in typing. When first learning to type, she reads the alphabetic letter she wishes to type, mentally selects the corresponding key, and consciously directs her finger to strike the key. But after being trained, she can simply read the letter she wishes to type and her finger will strike the corresponding key automatically. She no longer has to consciously direct her finger. It is as if a nerve circuit had been formed between her eye and her hand, and the nerve impulse traveled directly from her eye to her finger. The activity resulting from this built in circuit is known as a conditioned reflex. It is conditioned because it is built in or ingrained; it is a reflex because it is not consciously directed.

c. The same type of reflex circuit can be developed by a shooter. When he initially begins shooting, he must consciously direct his finger to pull the trigger when the rifle settles in the 10-ring. As a result of training however, a so called circuit will be established between the eye and the trigger finger. The eye, seeing a sight picture centered on the 10-ring, will then cause the finger to activate the trigger without a conscious mental effort on the part of the shooter. The shooter, like the typist, is aware of the activity of the finger, but is not planning or consciously directing it.

d. Interrupting the Reflex Action: The analogy with the typist was chosen because of the parallel of coordination between eye and finger. But the same type of conditioned reflex is by no means destined to be completed after it is initiated. A familiar example is the baseball player swinging at a pitch. He sees the ball coming, accepts the pitch as being within his batting zone (this acceptance does not necessarily involve thinking with words), and starts his swing. If the batter is well trained, the swing is "in the groove." It is automatic in the same sense that the typist's finger movements are automatic. He sees the path of the ball and automatically adjusts his swing to meet the ball. But if the batter suddenly sees that the pitch is a bad one, he can stop the swing before it crossed the plate. He can "break the circuit", so to speak, that has been established between the eye and his body muscles.

e. A shooter can do the same thing. He accepts a sight picture and the trigger pull starts automatically, just as the batter's swing started when he accepted the pitch. But if the shooter suddenly realizes that his rifle is beginning to move out of the 10-ring, he can "break the circuit" and stop the trigger pull. He must then begin the entire shooting cycle over again.

2. Basic Methods of Activating the Trigger.

a. The finger is placed close to the trigger, and may actually touch it. When the sight picture appears correct the shot is released by a single swift increase in finger pressure on the trigger.

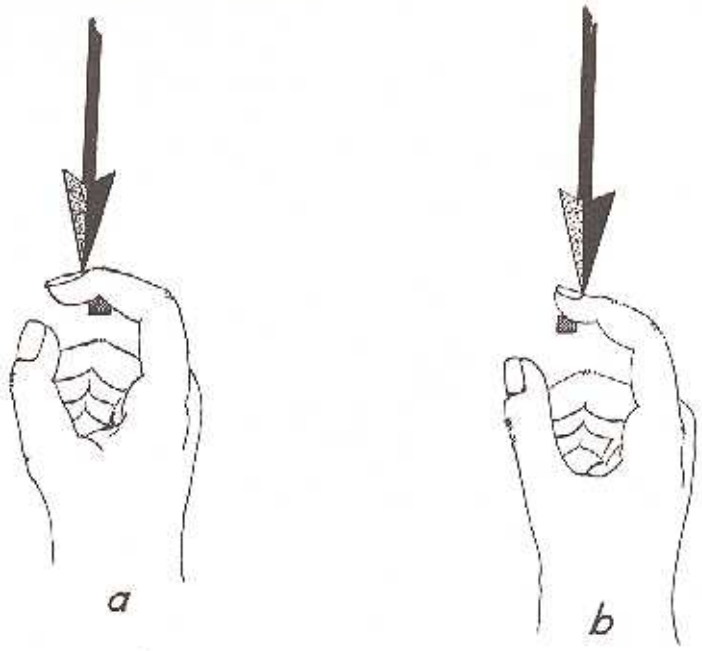
b. When the hold begins to settle, the finger applies pressure to the trigger. As long as the sight picture looks good or continues to improve, the pressure is increased. If the picture deteriorates, pressure is maintained at a constant level or removed completely. Pressure is resumed when the picture starts to improve. There are variations of each of these methods. A beginning shooter should experiment with more than one technique to find the method which best suits his coordination. He should then stay with that method until he has mastered it completely. Some advanced shooters develop a slightly different technique for each position.

3. Finger Placement.

a. In shooting with a light trigger---one that weighs under 8 ounces---the tip of the finger is usually placed against the trigger (Figure 17). This is the area of great sensitivity on that finger and this sensitivity is required for optimum control of light triggers.

b. Some shooters have developed good control when using medium weight trigger that weighs between 8 ounces and 2 pounds by placing the finger on the trigger at the first joint as shown (Figure 17A). There has also been some success in manipulating medium triggers by using the finger tip method usually reserved for a lighter trigger (Figure 17B).

c. When using a trigger that pulls greater than 2 pounds, the finger should be placed on the trigger as in (Figure 17B). This method permits greater control of relatively heavy triggers.



CORRECT PLACEMENT OF THE INDEX FINGER
ON THE TRIGGER

Figure 17. Placing the finger on the trigger.

4. Types of Triggers. There are several types of triggers used in national and international competition. Each of these triggers has been used extensively and successfully in competition. The shooter should choose the type of trigger which best suits his coordination and personal preference.

a. Single stage trigger - A single stage trigger is one in which no noticeable movement of slack exists until the instant the trigger sear disengages. Trigger weight or activation weight may range from pounds to ounces.

b. Two stage trigger - A two stage trigger has a noticeable amount of movement or travel before reaching a distinct resistance, at this point, it functions as a single stage trigger. When the pressure used to activate the first stage is released, the trigger returns to its original position; therefore, the first stage may be activated repeatedly without effecting the second stage function.

c. Set trigger - The set trigger may function as either a single or two stage trigger. If it is cocked only by closing the bolt, it acts as a two stage trigger; however, if it is cocked by closing the bolt and by the manual setting device, it functions as a very light single stage trigger. Weight variations may range from approximately 6 ounces to less than 1 ounce.