

ISSF Coach Course

RIFLE SHOOTING

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ISSF Coach Course

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INTRODUCTION

In material for the ISSF Coach Course Part I: an element of rifle shooting technique - shooting positions, was processed.

We will now deal with the other three elements of the shooting technique:

- Aiming and Sighting technique
- Triggering technique
- Breathing technique

All three positions – Standing, Prone and Kneeling will be covered since there are certain differences in the implementation of the technique between the positions.

We know that all elements of the shooting technique are equally important and interconnected. The stability of the rifle leads to more precise aiming and pulling of the trigger at the right moment. All this was followed by relaxation of the posture with proper breathing in the preparatory phase and a breathing break in the final phase of the shot processing.

Compared to the position, the technical elements of aiming and triggering are more specific and complicated to adopt because it is a micro-control of the movement of the rifle and index finger on the trigger. These are more noticeable by the coach, therefore the proper adoption and training of these techniques is based on the feedback that the coach receives from the shooter.

Optoelectronic devices help in monitoring the performance of the technique. The job is then easier for coaches and is not based on the subjective opinion of the shooter, which in many cases is wrong. The shooter himself can also confirm his opinion on the processing of the shot or correct it. This topic will be covered in more detail in the practical part of the course.

Also, in the Theoretical Part of this material, we will briefly look at shooting in different weather conditions and Weapon maintenance.

1. AIMING AND SIGHTING TECHNIQUE

Laymen say it's a piece of cake! Place concentrically the "Bull's eye" (black circle of the target), front sight and rear sight and hit the centre. This is not so easy if we want precise aiming and achieving high results.

Many times it has been said that for good shooting it is necessary to have a good eye (and quiet hand). If one looks on the international stage, it can be surprising to see how many shooters wear glasses, lenses or use a glass attached to the rear sight. For good shooting it is essential to have correct sighting technique and clear vision (with or without glasses).

The question arises, what is the difference between aiming and sighting technique?

Aiming technique relates to the sights and their interrelationship with respect to the "bull's eye":

- Sighting alignment
- Head position in relation to the rear sight
- Aiming should be binocular.

Sighting technique relates to the procedure how to aim:

- Approaching to the center of the target
- Aiming clearness
- Aiming time
- Follow through

Aiming technique

Sighting alignment

Sighting alignment is the same for all three positions.

Sighting aperture consists of:

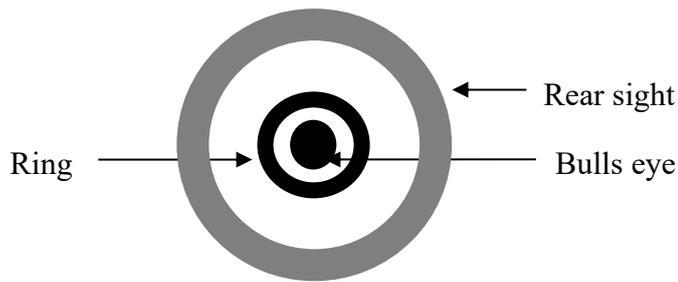
Rear sight aperture consisting of a part which is fixed to the rifle and a moving part that serves to correct the aiming point. The moving part has a hole (iris) through which the shooter is aiming.

Front sight consists of the ring which is placed in the middle of the tunnel.



The correct sighting alignment is described as follows:

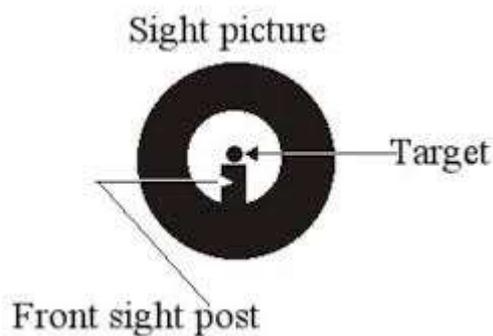
All three circles – rear sight, front sight and “bull’s eye” should be concentric so that the “bull’s eye” is in the middle of the ring which is in the middle of the rear sight. There should be visible “free space” between the ring and the “bull’s eye” for the shooter to control the movement of the rifle. There should also be “free space” between the rear sight and the front sight tunnel for the shooter to control the position of the front sight in the middle of the rear sight. The “free space” depends on the head position related to the rear sight and the opening of the iris blend.



More about these tasks will be said later.

Just for information, there is another sighting technique that uses a post instead of a ring. This type of front sight is used very rarely, although one of the best shooters in the world, Rajmond Debevec, has used it throughout his career in shooting with air rifle, small bore rifle and big bore rifle. This way is described as follows:

The post is set in the middle of the tunnel. The tunnel and rear sight remain in the same position as in the first variant. The post must be appointed in the middle down part of the "bull's eye" on the target. Between the post and the "bull's eye" is "free space" (with line). This "free space" is necessary because only in this way it is possible to make corrections in the sighting process.



The use of the ring is usual and recommended because the eye most easily recognizes symmetrical images, and this is the image of the three concentric circles.

Rear sight aperture

The standard rear sight is usually produced with a fixed iris with an opening of 1.1 mm in diameter. This diameter of the iris is not suitable for all shooting conditions, especially on the open shooting ranges. For this reason it is advisable to use an adjustable iris blend - whose iris diameter is usually from 0.8-1.8 mm. By opening or closing the iris blend, shooters can easily adjust the brightness and contrast between the front sight and the “bull’s eye”. Some types of iris blend have filters in different colors which are used under different lighting conditions, and a polarizer when the target is very bright.

The rear sight has a very sensitive adjustment of the aiming point. Depending on the quality of the rear sight we can find them with 10 or 20 “clicking” for a full turn of the adjustment screw. The shooter should check how many *clicks* he needs to turn for one ring, for example 10.0–10.9. The number of clicks depends of the length of the aiming line and the precision of the rear sight.

Front sight

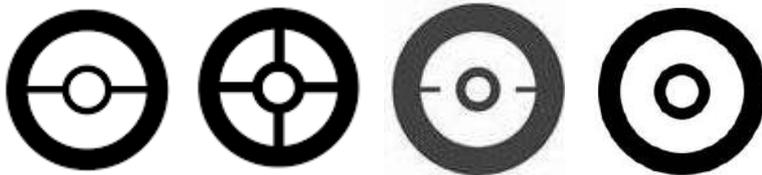
Front sight plays a very important role in the accuracy of the aiming process.

In the past the front sight **ring** looked very simple - it was a piece of stamped sheet metal. Over time plastic rings first appeared, and more recently adjustable rings have developed and taken precedence. Adjustable size and thickness of the ring allows shooters to adjust the optical image and adapt it to their needs.

The size of the ring determines the accuracy and precision of aiming. This depends on the “free space” between the ring and the “bull’s eye”. If the ring is too big, aiming will not be as precise. If it is too small, the shooter cannot control the rifle because the “bull’s eye” will not be inside the ring all of the time. As a rule, the ring should be 1/3 larger than the “bull’s

eye`, but it is not always the case. The size of the ring also depends on the stability of the rifle.

The most common types of **ring** are:



The crossbars are used to prevent a different canting of the rifle during shooting.

In the case of small bore rifles, the use of a spirit level is permitted to avoid different canting of the rifle.



There are different colors of the rings such as yellow, green, blue... Nowadays, shooters



often use a yellow ring when shooting on electronic targets with the white light inside because they are very bright.

An integral part of the front sight is a **tunnel** in which the ring is located. It protects the ring from the effects of light visually distorting the image of the ring, as well as enhancing the contrast between the ring and the target. By moving the tunnel forward or backward the shooter can adjust the size of the “free space” between the ring and target.

Size of the ring and opening of the blend will be elaborated in detail in the practical part.

Head position in relation to the rear sight

As explained in the First Course, the head should be straight and the shooter's eye is directly in the line of aiming.

The question is, where is the position of the head in relation to the rear sight?

The correct position of the head is where the eye is 2-3 cm away from the iris. In this way the shooter can control the mutual relationship of all three circles – iris, ring and “bull's eye”. The problem will occur if the shooter does not put his head at the same place every time. Putting the head slightly forward or backward leads to height errors.

Some shooters like to have their head close to the rear sight so that they feel the rear sight with their eyebrow. Touching the rear sight with the head is forbidden by the rules.

Advantage of this position is that the shooter places his head the same place every time because he has a parameter – feeling the rear sight on the eyebrow. Also, during windy conditions it is possible to see the wind flags through the iris blend.

The disadvantage is that the shooter cannot see any small movement of the head during aiming which will produce errors in the alignment of the sights.

Aiming should be binocular

Aiming should be binocular (with both eyes open) for the following reasons:

There is no additional effort as is when closing one eye, which is very important during long shooting sessions. Binocular vision sharpness is greater than monocular. The impulses that come to both eyes cause greater excitement of the corresponding parts of the central nervous system. Therefore, the exhaustion of the brain cells are smaller since they operate under

natural conditions. Closing one eye influences partial closing of the other eye, influencing sharpness in the vision.

Shooters who have a dominant aiming eye have no need to cover the other eye. This is a significant advantage especially when shooting in the wind when it is much easier to follow the wind flags.

Other shooters must use a cover to avoid duplicating the target image. It is recommended to use a narrow and transparent blinder to get as similar a situation as without a blinder. Complete coverage of the eye can lead to impaired coordination and different light perception for the aiming eye.



Sighting technique

Target approach

One of the most important elements of the aiming technique is approaching the center of the target.

Achieving high results is largely based on the symmetry of the sights and the automatic execution of the movement in the complete procedure of processing the shot.

For that reason, target approach should always be **from the same side and in the same way**. Noncompliance with this rule leads to errors because the aiming point will not always be in the same place.

The side of approach is directly related to the movement of the rifle during inhalation and exhalation. For this reason, the side of approach is different in the standing position than in the prone and kneeling positions.



In the standing position during inhalation the rifle is going up and during exhalation is going down. The shooter is relaxed in his position and will stop breathing during exhalation.

Therefore, the straight approach to the target from above at 12 o'clock is natural and recommended. Approaching from 1 o'clock is also acceptable because the rifle is positioned on the right side of the body.

Following the rules about breathing in prone and kneeling positions, approaching to the center of the target is from below at 6 o'clock.

Similar to the standing position, some deviations also exist in the prone position. If the left elbow is placed more to the left of the rifle, the approach can be as early as 7 o'clock.



More on this topic and errors that occur will be explained in the practical part.

Aiming clearness

Very often the question arises as to where the shooter should keep his focus during aiming. In pistol shooting the answer is simple – always on the front sight. This is easy because the pistol target is much bigger. The shooter will aim below the “bull’s eye”, so he sees the “bull’s eye” relatively clear even when the focus is on the front sight.

In rifle shooting the situation is quite different. The target is much smaller and the “bull’s eye” is placed in the middle of the front sight.

In order for the shooter to have control and a clear image over the position of the ring in relation to the “bull’s eye” at all times, the focus should alternately be on the ring and on the “bull’s eye”.

At the last moment before triggering, the focus should be on the “free space” between the ring and the “bull’s eye”. The shooter makes sure that the relation of the ring and the “bull’s eye” is symmetrical.

Aiming time

Aiming time varies from shooter to shooter. Some will pull the trigger after 2–3 seconds which we call “pull at the first picture”, and some will pull the trigger after 15–20 seconds of aiming.

Aiming time is in direct correlation with the shot processing procedure. If the shooter assumes the same position with the rifle in the stance, relax during breathing and approach the target in the same way, 4–6 seconds are enough to release the shot. A small number of shooters have the courage to pull the trigger earlier at the “first good picture”. Usually they like to check two or three times that the aiming point is on the right place. This is particularly justified when it comes to large international competitions where the pressure and nervousness are great.

In other cases, shooters with a good hold and stability of the rifle like to aim too long, said in slang “they watch TV”. They are so satisfied with the stability of their rifle that they are forgetting to pull the trigger. Aiming too long produces distortion of the picture, eye muscle fatigue as well as body muscle fatigue. In that case there are mistakes that the shooter does not notice because he thinks that he shoots at the correct picture, but the real picture is long gone.

Follow through

The follow through can be explained as an extended aiming app. 2–3 seconds after the trigger is released.

Follow through has two main functions:

- Mental part: the shooter holds concentration a few seconds after the shot is released and should imagine how the shot entered the middle of the target. In that way he maintains a steady position and focus so that only the index finger works to pull the trigger;
- Feedback how the shot is released: recoil of the rifle shows how the shot is released. The shooter needs to see the direction of the jump and the place where the front sight has returned. If the jump is straight up and the front sight returns to the middle of the target, the shot is performed in the correct way. If not, some error occurred and the shooter needs to get that information so not to make a new error.

SELF - EVALUATING QUESTIONS:

What is the relationship between the rear sight, front sight and ``bull's eye``?

What are the important elements of trigger control?

What is the follow through and what is its purpose?

2. TRIGGERING TECHNIQUE

The technique of triggering has a great, often decisive importance for the achievement of a good shot. First of all, triggering must not disturb the point of aim. Because of this, the shooter has to know how to pull the trigger evenly. Second, triggering has to be performed during a breathing break in accordance with aiming, when the sights and the “bull’s eye” are concentric. As a result, in order to achieve a good shot, the shooter has to act – not separately, not isolated one from another, but mutually in accord.

Bringing these two elements in accord is necessary because during triggering the rifle is not still, but moves more or less depending on the stability of the position. As a consequence of that, aligned sights stay in the middle of the target for a very short time, while the shooter has to pull the trigger evenly and smoothly. Since the movement of the rifle, for example during shooting in the standing position, is in most cases an individual thing for each shooter, it is very difficult to foresee the time and duration of these short breaks of aligned sights concerning the “bull’s eye” of the target.

These difficulties are even worse because bringing these two elements into accord in such conditions, at one hand, is contrary to the natural reactions of the body and the habits acquired in the previous period of human life. But, on the other hand, new habits should be formed directed to the improvement of coordination of the movements controlled by the sense of sight.

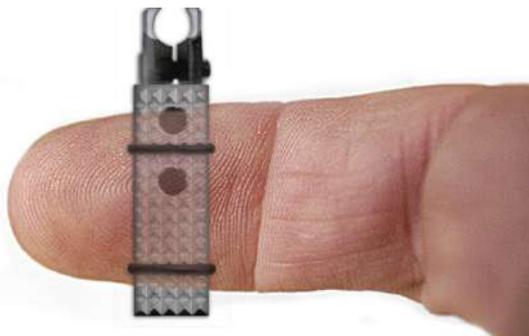
The conditions for correct triggering

Trigger cleanness

Since triggering has to be done so as not to disturb alignment of the sights and the “bull’s eye”, pulling the trigger evenly, smoothly and cleanly raises the question of special demands for the index finger of the right hand. The quality of a shot mainly depends on this because the most precise and careful aiming will be disturbed by the smallest incorrect movement of the finger. In order for the index finger to perform this task without interrupting the aiming point, it is necessary to hold the pistol grip correctly and provide the suitable support that will allow correct triggering. Holding the pistol grip should be tight enough, but not too tight, because the effort of the palm muscles can cause unnecessary movements of the rifle. It is also necessary to find such a position for the palm so that there is a clearance between the pistol grip and the index finger.

More about grip and gripping will be explained in the practical part.

The movement of the index finger during triggering should not cause any side pressures that could move the rifle and in that way disturb aiming, that is, disturb the line of aiming. In order to perform correct triggering, it is necessary to pull the trigger with the finger part where the fingerprints start. This finger part is the most sensitive so the shooter can control the pressure on the trigger blade in the best way.



We have determined the point of contact of the index finger, and now we need to determine the point of contact on the trigger blade.

Nowadays we find different shapes of trigger blades such as: straight, curved, ball or even as a needle. Each of them has advantages and disadvantages.



Straight



Curved



Ball

The basic rule for all shapes of the trigger blade is that the fingertip must be placed on the same place every time.

First two shapes are most common and recommended.

The fingertip rests on the entire width of the straight trigger blade. The shooter feels the edges of the blade so that he can easily feel every pull of the trigger blade to the side which leads to errors.

The disadvantage of the straight shape is that the shooter can easily make a mistake in placing the fingertip in height. This leads to a change in the trigger weight which causes errors in the timely realization of the shot.

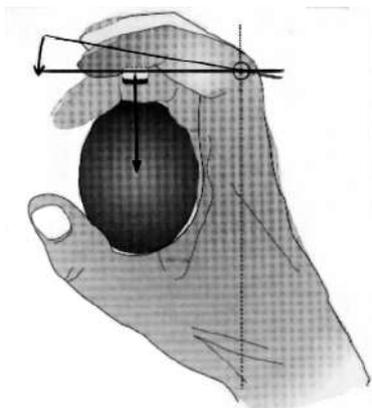
Solution is to put a marker on the trigger blade such as a thin rubber.

At the curved shape, the shooter will place the fingertip on the same place but pulling the trigger can be a little higher or lower, which will result in height variations.

At the ball or needle shape, the fingertip is on the same place every time but pulling the trigger can very easily be in different directions, which produces errors. Also, since the surface of the trigger blade is very small, during shooting the shooter's sense of triggering changes.

The trigger blade should be pulled straight back so the index finger moves parallel to the barrel axis. If the finger pulled the trigger from aside, that is, under the angle concerning the barrel axis, it could cause an increase in the weight of triggering, an uneven jumping movement of the trigger caused by the angle and additional friction of the parts of the triggering mechanism. It also can disturb the aiming point and be the cause of a great discrepancy of shots from the centre of the target.

In order to satisfy the above condition, the fingertip should be at a right angle to the line of fire; the index finger should be parallel with the barrel; and the trigger blade should be at a right angle and vertical under the barrel.



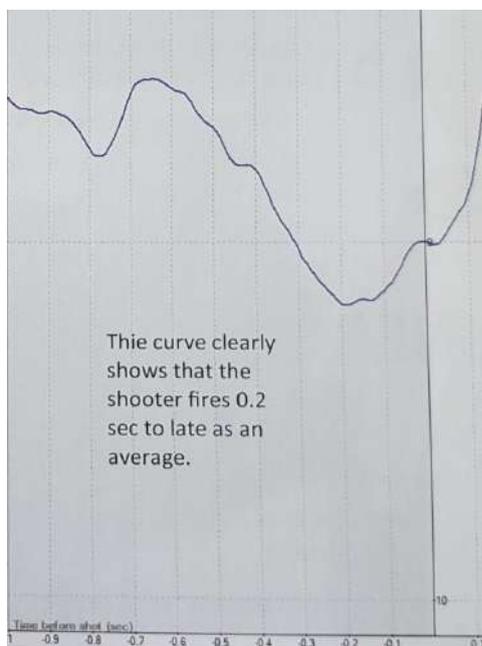
Trigger timing

Although the pressure on the trigger should be applied evenly and gradually, it does not mean that it should be done slowly, but equally and without jerks.

However, just the skill of pulling the trigger is not enough for a good score. The second obligatory condition is that the action of the index finger is in accord with the correct aiming while pulling the trigger.

Two problems arise when we want to combine these elements:

- Neurological - it takes a while for the signal from the brain to reach the finger to pull the trigger;
- Mechanical - the trigger mechanism needs some time between pulling the trigger blade to releasing the shot.



Analysis with optoelectronic devices and tests shows a 0.2 second delay in the reaction of the finger when the light is turned on, in trained shooters.

In the camps for young and prospective shooters in Serbia, our Institute conducts tests of the reaction on the light. The shooters who had a reaction speed of 0.2 seconds progressed much faster and became top competitors related to others who had a slower reaction. This can be one of the main indicators when

selecting young shooters.

Nowadays, more and more manufacturers of the sport weapons are starting to produce electronic trigger mechanism. The reason is that the electronic trigger is faster than mechanical, and is more constant and easier to adjust.

This leads us to the conclusion that the shooter should predict when the rifle will reach the middle of the target and be ready to release the trigger on time.

Prediction is especially used in the standing position as the period of stillness of the rifle in the middle of the target is very short. Very often we see the shooter throw the shot out of the center even though the aiming picture was ideal because he was not prepared for the final impulse on the trigger blade.

It requires adherence to the entire shot procedure: assuming the position, correct breathing, target approach and preparation for triggering.

Very often a question between shooters and coaches is what pressure on the trigger blade is needed to release the shot? Or simply said, how much is the trigger weight in grams?

Factory setting is usually 70–80 grams and is quite good for the starting position. It is not a strict rule as settings down to 40 grams or up to 150 grams are also used. The pressure of the trigger is individual and each shooter should find the best value for him.

Usually experienced shooters use a lower value because they have built-in the sense of triggering, so lower pressure helps them pull the trigger at the right time.

Beginners and nervous shooters use higher values to avoid misfires due to a weaker feeling on the trigger and high tension in competitions.

The ways of triggering

By the way of setting the mechanism, triggering can be divided into:

- Triggering with single stage – direct
- Triggering with the two stages

Direct triggering is mainly used by well-trained shooters whose rifle fits them well and the accord between aiming and triggering is almost brought to perfection. It is simpler and “faster” because the shooter does not waste time pulling the first stage.

The disadvantage is the greater risk of misfires and more difficulties in adjusting the trigger mechanism. The weight of the trigger pull usually is in the range of 50–60 grams.

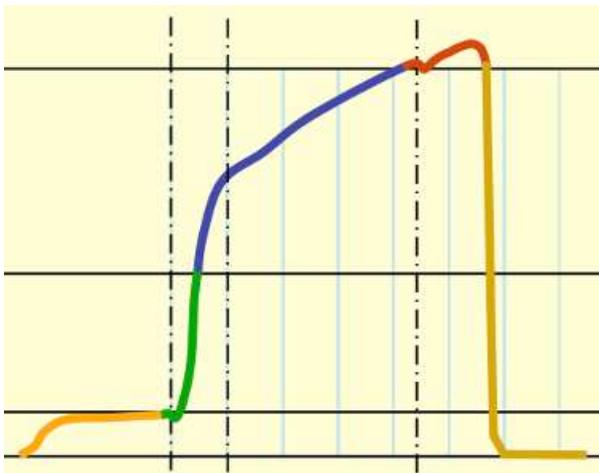
Triggering with the two stages is more suitable for beginners and nervous shooters. During the first stage the shooter can feel the position of the fingertip on the trigger blade without being afraid of misfire. By overcoming the first stage he mentally prepares for the final part of triggering. In the beginning, the first stage is a few millimeters long. As the triggering sensation increases, the length of the first stage decreases and approaches direct triggering.

The weight ratio of the first and second stage depends on the affinity of the shooter - whether he prefers a lighter or heavier first stage. The starting ratio is usually 50:50 and the total weight is not less than 60 grams.

By the way of pulling the trigger, triggering can be divided into:

- Even
- Gradual
- Pulsating

Even triggering is used in firm positions – prone and kneeling. The rifle is more or less in a

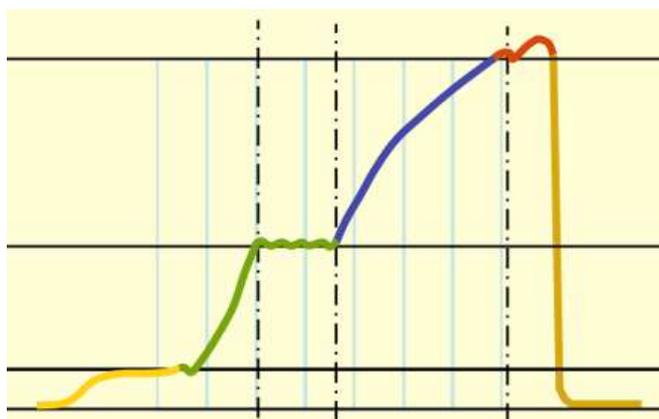


stable position. The convenient moments for triggering are long-lasting and the quality of a shot does not depend on whether triggering comes a second earlier or later. After reaching the good aiming picture, the shooter should start to pull the trigger evenly and without interruption until it fires.

This way should also be applied in the standing position. Young and not well-trained shooters have difficulty balancing with the rifle. The movement of the rifle is great, while the periods of calmness are very short. In these cases the shooter should, with no concern to the movement of the rifle, start to pull the trigger evenly right after rough entering of the rifle into the target, trying to finish the shot before the movement of the rifle increases as a result of muscle tiredness.

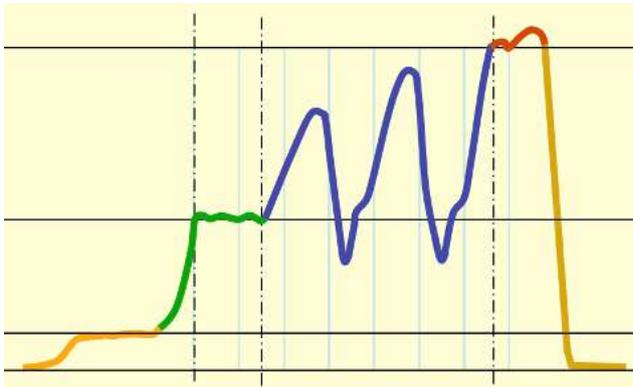
Gradual triggering is used by experienced and well-trained shooters while shooting in the standing position. The rifle moves considerably less and the periods of calm are longer. It is implemented in three phases:

1. Placing the fingertip on the trigger blade, checking his correct position and pulling the first stage – breathing stopped and the aiming process started;
2. Increasing the pressure to the second stage until about 80 percent of the overall weight – the aiming point is close to the middle of the target and the shooter is ready to release the shot;
3. Releasing the shot when the shooter needs to master only about 20 percent of the trigger weight – rifle is pointed at the middle of the target and final finger movement should be relatively fast, but smooth.



This way of pulling the trigger requires a lot of practice to create a sense of control of the pressure of the fingertip on the trigger blade.

Pulsating way of triggering is the modification of the gradual way. The index finger is not



as still as with triggering during even and gradual triggering. It constantly and evenly moves and periodically increases and decreases the pressure on the trigger blade. Each next pressure is bigger and bigger. At the most convenient moment

for firing, increased pressure of the shooter manages the resistance of triggering.

The advantage of such a way of triggering lies in the fact that the shooter, by moving the index finger uninterruptedly and rhythmically, acquires psychological and nervous-muscular balance in the nervous processes of excitement and calming down, which allows higher speed of reaction and coordination of movements.

As the adoption of correct pulsating triggering is connected to important difficulties for whose management high practice is needed, it is recommended only to top shooters. With inexperienced shooters the possibility of misfire is increased with this way of triggering.

Furthermore, during pulsating triggering there are some elements of “hunting” the convenient moment for firing a shot, which makes possible jerks, as in the “hunt” for the ten.

SELF - EVALUATING QUESTIONS:

What are the conditions for correct triggering?

What is direct triggering?

Describe triggering methods.

How does the gradual triggering work?

3. BREATHING TECHNIQUE

Correct breathing and making a breathing break is another element that influences the score and the continuity of good shots during the match.

It is well known that during the final sighting process it is not good to breath. Breathing is connected with rhythmical movements of the thorax, abdomen and shoulder system, resulting with weapon movements that are negatively influencing precision. It is therefore recommended to make certain breathing stops during firing the shoot. It is necessary to recognize breathing as a physiological process that is permanently happening in the organism and is connected with blood flow, distribution of the oxygen and carbon dioxide, metabolism and complex reaction in the central nervous system. All these processes have an important role in the organism's correct functioning. Therefore, during shooting stadiums, breathing has to have an important role in micro as well as macro-cycles. Incorrect breathing technique can and will negatively influence the general condition of the shooter and will result in a bad shooting outcome.

It is very important that the shooter understands the importance of developing a deep-breathing diaphragmatic process that fills the entire lungs on the in-breath. Simply said, the shooter must breath by moving the diaphragm towards the stomach and not by spreading the rib cage.

Chest breathing causes the chest to move forward and the shoulders to rise, leading to the expulsion of the body balance and greatly prolonging the process of realization of the shot.

The deeper and slower the breathing process, the more effective the oxygen is supplied to the brain. A deep and rhythmic breathing process induces calming effects that improve concentration and levels muscular tension.

During normal breathing, a person makes 12-15 breathing cycles in one minute. This means that one cycle (inhaling, exhaling and breathing pause) lasts 4-5 seconds.

What is interesting from the shooters point of view is that we can, without any special effort, extend the breathing pause for about 12-15 seconds without any serious physiological problems. This time is more than enough to execute a correct shot. In order to fire a single shot in optimally quiet conditions, the shooter usually takes 2-3 deep breaths and then slowly and incompletely exhaling, before stopping the breathing process.

In order to make the most of breathing for position relaxation and mental preparation, each subsequent inhalation should be smaller and the exhalation slower.

Stopping breathing should not be on command but natural.

There is a difference in how much air should be retained in the lungs from position to position.

This is directly related to the timing of the sighting process and the required relaxation of the position.

In the standing position the sighting process is longer and the shooter needs more air in his lungs. The shooter should exhale about 60–70 percent of air so that he could relax the position and have enough air to conduct the shot.

In prone position the sighting process is much shorter and the stability of the rifle is high. Precision is also on the highest level because each shot except 10 is a bad shot. For this

reason, the shooter should completely relax his body. This will best be achieved if he exhales 80-90 percent of the air. Simply put, he should be spread on the floor.

In kneeling position, the amount of the air that remains in the lungs is somewhere between the standing and prone positions.

To prevent fatigue and side-effects during a long competition and multiple disturbed normal breathing processes, it is necessary to advise the shooter not to take a long breathing pause. Before starting the next shot process, it is necessary to take a few deep breaths in order to release residual quantity of carbon dioxide and take necessary quantum of oxygen. This technique should be applied during all shooting exercise/match.

To practice diaphragmatic breathing, the coach or the shooter himself puts his hand on the stomach and breaths in a way that only his hand moves, not the rib cage.

The shooter should also be physical training – running, swimming, bike riding, etc., to enlarge his lung capacity so that he could renew the oxygen in the lungs faster, and by this the concentration would also be at the higher level.

SELF - EVALUATING QUESTIONS:

What is the breathing process during the aiming procedure?

Describe the stop of breathing techniques?

What are the two important elements in the breathing process?

4. SHOOTING IN DIFFERENT WEATHER CONDITIONS

In addition to adopting and training basic shooting skills, the shooter should also learn the elements of shooting tactics.

One of the most important elements of tactics is shooting under different weather conditions.

As per ISSF Rules, all rifle events on 50 meters must be held on open shooting ranges, so that the influence of different weather conditions greatly affects the final result.

There are exceptions when the competitions are held in an indoor shooting range such as the World Cup Final in Munich. It is not so common and with a small number of participants.

Each shooting range is different and influence of the weather conditions is also different.



Some shooting ranges have nets used to slow down the strength of the wind as it is in Munich or walls on the sides and between each ten places as it is in Plzen. On newer shooting ranges, the installation of nets is prohibited which makes shooting even more difficult when the wind conditions are unfavourable. Also, on some shooting ranges there are ditches as a protective barrier of ricochet breakthrough as it is in Milan or Baku.

Some shooting ranges have a canopy over the target so that the targets are constantly in the shade which drastically reduces the impact of light changes on the shot. But, many of them are without protection and direct impact of light changes does occur.



Shooting ranges where the ground between the target and the shooting range is at the same level as the shooting place, is much more susceptible to the influence of mirage. Other shooting ranges have a recess between the shooting place and the target as a prevention of

ricochets and mirage.

All this requires coaches and shooters to get acquainted with the conditions at each shooting range to make the most of training and time before the competition to prepare shooting tactics in the competition.

When it says different weather conditions, we usually mean wind, changeable light conditions and mirage.

Wind

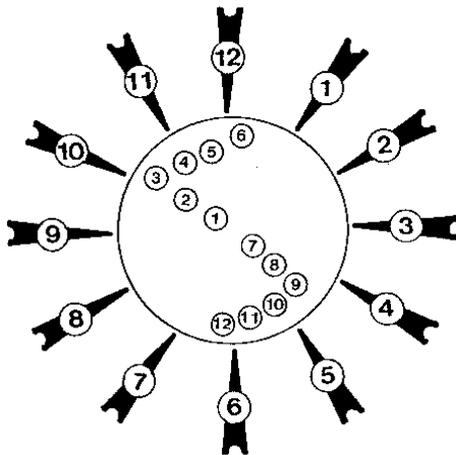
The most frequent weather situation on the open shooting ranges is wind. It can make many problems for shooters to achieve high scores.

In order to fight the influence of the wind more easily, first it is necessary to know the basic rules of how the wind affects the trajectory of the bullet.

It is not easy because the bullet has some rotation after it leaves the barrel. Each barrel has rifling that gives the bullet rotation and improves the accuracy of the rifle. The bullet rotates clockwise. Therefore, if the wind blows from the left side the shot to be down-right; while the wind blows from the right side the shot to be up-left. The wind that blows towards the shooter the shot to be low; while the wind that blows to the target the shot to be high.

How the wind affects the place of a shot is best represented and referred to as the *Clock* system which shows the place of the shot on the target depending on the direction of wind. Every shooter has to know this Clock system and remember it so that he can know how to shoot during the wind.

Clock system



The shooter can see the strength and direction of the wind by flags at the shooting ranges. According to the rules, at the small bore ranges, there are two flags between each shooting place - one at 10-meter and the other at 30-meter distance. The dimensions and weight of the flag are accurately determinate by ISSF rules. The flag size is 50 mm x 400 mm and weight 150 g/m².

Depending on which material is used, in rainy conditions the flags become wet and heavier so they do not give a true picture of the strength and direction of the wind.

Also, a good perception of the wind direction depends on how the flag is attached to the pole. Usually the flag is turned around which shows the amount and direction of the wind relative to the firing line (to the shooter or to the target). If the flag does not turn around the pole it is

much more difficult to determine the direction of the wind. Under that condition, the shooter should follow 2-3 flags left or right to establish the wind direction.



The flag at 10-meter distance is more important than the flag at 30-meter distance because the mistakes are greater if the bullet is moved for the same value at the distance of 10 meters than at the distance of 30 meters. It is not the strict rule.



In some cases the first 10 meters of the shooting range is covered or there is a net 10 to 25 meters long. In this case the flags at 30 meters are more important as they give a much better realistic picture of the direction and

strength of the wind.

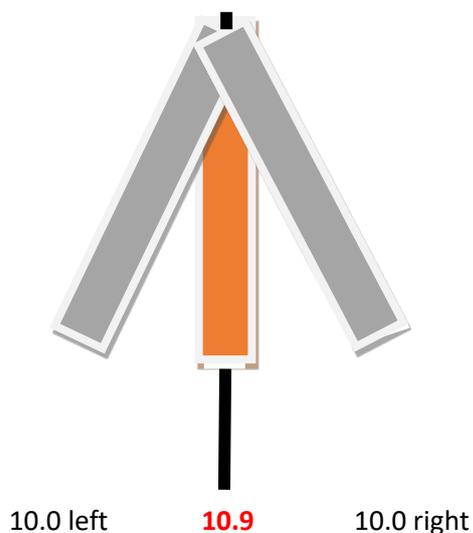
Before the beginning and during the competition, the shooter should notice the movement of the wind - its direction, strength and interval at which it blows. Depending on that, he can use one of three ways of shooting during the wind or combine them:

1. Waiting for the same wind condition

2. Adjusting the rear sight
3. “Shading” – aiming aside

Basic rule for all three ways is: the flag must not extend the angle of 45 degrees aside because under any larger angle or when flickering, there is no possibility to determine the strength of the wind.

First and most frequent way, especially for shooters without experience is “to wait his wind”. This way the shooter will wait for when the wind is mainly stable and constant in one direction with some intervals when it does not blow at all. During the sighting shots, the shooter has to adjust sights on the wind which is most frequent. During shooting at the competition targets, always fire while the flag is in the same position as it was during the sighting. When the wind blows in shorter intervals, the shooter should adjust the sights in time without the wind and then during the competition wait for the conditions when the wind does not blow or the flag is within app. 30 degrees aside and fire as many bullets as possible. The point is to keep the center of the group of shots in the middle of the target. This means, when it’s calm for the shot to be in inner ten and when the flag is within 30 degrees aside for the shot to be in 10.0.

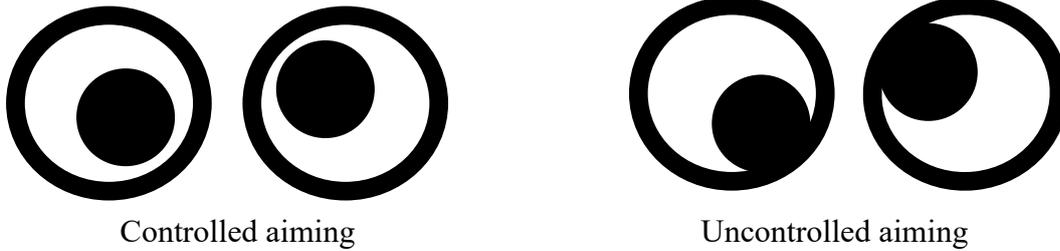


As easy as this way of shooting is to learn, it is difficult to implement the shooting technique because the rhythm of shooting is constantly changing. Nowadays, when the match time is reduced, the shooter does not have as much time to wait for good wind conditions. Also, the shooter gets tired quickly and makes mistakes due to prolonged aiming while waiting for the right wind. This requires a lot of training with a variable shooting rhythm, especially for shooters who have a longer preparation for the shot.

Second way is for shooters to use when the direction of the wind is changeable in longer intervals. The shooter can shoot in such a way so that he can constantly keep the group centered by adjusting the rear sight. During the sighting shots, the shooter should notice how much he should move the rear sight when switching from one to the other wind direction. During this kind of shooting there has to be great concentration if the shooter does not want to confuse the direction of the rear sight movements. It usually happens after a pause in shooting that the shooter forgets which wind direction he was adjusted at.

Third way is most famous from top shooters with extensive experience. It is aiming out of the center of the target, popularly called “shading”. This way is used when the wind quickly changes the direction and the shooter is unable to adjust the sights in time or wait for the direction of the wind he has made sight adjustments for. Most often this way of shooting is used in the finals because the shooter has a time limit and he is unable to adjust the sights because of a change in the wind direction. The shooter has to be very experienced and versatile for this way of shooting and know how much he can aim aside and still have a good shot. He has to know the Clock system very well.

As the wind direction is most often left or right, the shooter should practice aiming at 4 and 10 o'clock.



Also, the size of the front sight plays an important role. As we know, the “bull’s eye” should be inside the ring at all times so that the shooter could control the movement of the rifle. If the ring size is too small, “shading” will not be enough to prevent the influence of the wind. Under strong wind conditions, the shooter should increase the ring size in order to have enough space for “shading” and, at the same time, control over the movement of the rifle. If the hold of the rifle is better, then using the “shading” way is simpler. It is most commonly used in the prone and kneeling positions due to greater stability of these positions and shorter aiming time.

The shooter should learn and train all three ways to easily adapt to a particular way of shooting depending on the wind blowing.

Besides the flags, the shooter can use other aids to determine the direction and strength of the wind: grass movement, mirage movement, direction of the rainfall, the feeling of the wind on the face or neck. This is extremely important because when the wind blows towards the shooter or to the target it is harder to notice the flag positions. That is why the shooter should keep an eye on 3-4 flags to the left and right of his position because only then can he notice if the wind blows in these directions. Following various flags on both sides also allows the shooter to see the arrival of the wind and be completely ready for firing or delaying.

The shooter must be able to see how the flags are placed between each shooting place without any problem. If this is not the case, the shooter has the right to ask the judge to move the flag before the start of the competition in order to see it unhindered. Also, the shooter should use a

narrow blinder so he can follow the flags with the left eye. The best way is to shoot without a blinder if it is possible.

Shooting under changeable light conditions

Light changes are also frequent like wind conditions at open shooting ranges, especially if there are no eaves over the targets. They occur during the changes of weather conditions sunny-cloudy, because of the sun movement and shade appearing on the target. If there are small eaves above the target, the target would not be protected all day from the sunlight. Also the lighting at indoor ranges vary from range to range.

Basic rule for changing the group of shots is: if the target becomes dark, the “bull’s eye” visually appears bigger and the group of shots moves low and opposite. If the sun goes from left to right, the group of shots will go to the left and vice versa (on the shooting ranges which do not have the correct orientation, toward a north-north easterly direction).

Ways of shooting are similar as during wind conditions. If light changes are often, the shooter has to shoot under the same light conditions he shot during sighting shots. If the changes last longer, he should adjust the rear sight according to the above-mentioned movement of the group shots.

Adjustable iris blend with colored and polarizing filters and an adjustable front sight helps a lot to overcome changes of the light conditions.

Under bright conditions we should decrease the iris diameter to reduce the amount of light in the eye. Also, using the different shades of gray filters improves the contrast in aiming. A polarizing filter is used when the target is extremely bright, especially when the target is white.

Under dark conditions we should increase the iris diameter to get more light in the eye. Yellow or green filters are used to improve the contrast in aiming.

A change in the diameter of the front sight is also used. The point is to get the aiming picture as similar as possible to what the shooter is used to.

In the finals, when there is not a possibility of the fast adjustment of the rear sight due to the sudden light changes, the shooter should aim a little lower or higher depending on the light situation – “shading”.

If shadow or light starts to come to the target because eaves are above the target, the shooter has to wait until the whole target is under the same light conditions.

Mirage

Mirage is wavy flickering of hot air. Sometimes it occurs in the morning or during hot days, especially after the rain. It is most frequent on the shooting ranges where the shooting line is level with the shooting range. The greatest number of difficulties occurs in the prone position - the lowest position. Because of the constant flickering and distortion of the “bull’s eye” of the target, it causes great difficulty for shooting. If there are no conditions for the shooter to wait for the mirage to disappear, here is some advice on how to shoot during a mirage:

The shooter can use a polarizing filter which decreases the distortion of the “bull’s eye”. If he does not have one, or it does not help, the shooter has to pull the trigger in “the first picture” because the eye is then at ease and can sharpen the picture. Longer aiming time causes greater distortion and flickering of the “bull’s eye” which leads to larger aiming errors. Some shooters use binoculars to see when the target is sharp and pull the trigger in that moment. This technique demands the binoculars to be adjusted in such a way so that the shooter can see the target through the binoculars just by moving his look. When the conditions are favorable, quickly transfer the look to the sights and press the trigger. Many shooters do not

carry binoculars when shooting at electronic targets. Coaches should always have a binocular to check for mirage, especially if they know the shooting range is level with the shooting place and advise the shooter how to shoot in those conditions.

SELF - EVALUATING QUESTIONS:

How the wind direction affects the trajectory of the bullet?

Describe techniques of shooting in wind conditions.

How the shot group changes depending on changes in light conditions?

What shooter should do when a mirage occurs?

5. WEAPON MAINTENANCE

The rifle is the basic equipment of the shooter. Without a good weapon and ammunition there are no high scores. Nowadays the weapon has almost achieved perfection in the production quality and the production accuracy. Regardless of this, because of the great number of shots and different weather conditions, damages and malfunctions of the weapon may occur if the weapon is not maintained.

The shooter has to get to know all the characteristics of the weapon he uses, its functions and possibilities that it offers for adjusting the weapon to the shooter.

Before each training and competition it is obligatory to perform the control of firmness of all the rifle parts, tightness of screws and check that all the parts are set for the specific positions: the position and size of the front sight, the position of the rear sight, butt plate, cheek piece, pistol grip, hand stop...

The weight and clarity of triggering is another important element that the shooter has to pay attention to. The change of weight and clarity of triggering during shooting can drastically influence the quality of shots and security during shooting. The shooter must not compete with incorrect triggering or else he has to correct it the moment he notices it.

Cleaning and maintenance of the weapon not only allows it to be long-lasting, but also gives the shooter the confidence that his weapon is good, is in order and able to achieve high scores.

What a shooter basically has to do is as follows:

- Clean the barrel regularly - of the small bore rifles and the bolt after every training and competition and after about 1000 shot pellets with the air rifle;
- Maintain the outside metal parts of the rifle - barrel, bolt and sights;
- Regularly check the tightness of the screws on the rifle as recommended by the manufacturer concerning the power of tightness by the torque-wrench;
- Regularly check the accuracy of the sights – clean the iris blend, filters, front sight tunnel and rings of the dirt;
- Clean the triggering system;
- In the electronic triggering system, check the condition of the batteries regularly and change them on time;
- Check the triggering weight and if necessary do the adjustments or have the trigger serviced if it is out of order;
- Control the speed of the pellet since it is the best way to check the function of the rifle. The speed must not vary more than 1 – 2 m/s with the tested pellets;
- If the recoil increases, there is a problem with the stabilizer. Adjusting the stabilizer is a very sensitive matter so it is best to ask for help from the gunsmith.

Cleaning of the small bore barrel:

- Cleaning is done by a metal stick, cloth/absorbent cotton and the oil for weapon cleaning;
- It is obligatory to use a plastic extension at the place of the bolt in order not to damage the beginning of the barrel;
- The stick must not go out of the barrel because it can damage the mouth of the barrel;
- Sometimes use the brass brush for removing the deposited lead in the barrel;
- The barrel should be dry before the beginning of the training or competition.

Cleaning of the air rifle barrel:

- Cleaning is done by the nylon rope and cloth/cotton straps or with patches. Using oil for cleaning the barrel is not recommended;
- Clean the barrel in only one direction - from the action system towards the top of the barrel.

SELF - EVALUATING QUESTIONS:

What a shooter has to do about weapon maintenance?

How to clean the barrel of a small-bore rifle?

PRACTICAL PART

1. HOW TO AIM

As we passed the three elements of the shooting technique in the Theoretical part – aiming and sighting, triggering and breathing, now is time to explain how to implement that knowledge in practice. How to learn them and which errors most commonly occur during shooting.

First chapter in the Practical part is ``How to aim``.

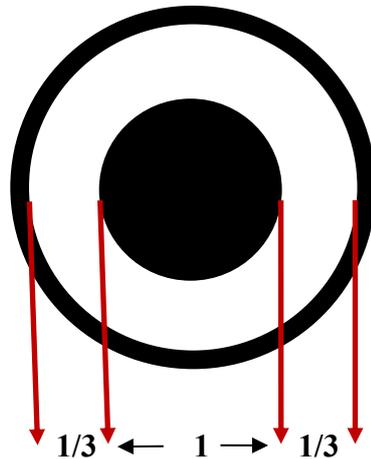
The aiming picture looks very simple – three concentric circles of the iris aperture, ring and “bull’s eye”. That is it. But, is it so simple?

Each shooter sees differently and has a different level of precision in aiming.

In the beginning stages of learning, the shooter should be taught how to aim. He should be drawn a picture of how the sights stand in accordance with the “bull’s eye”. He then should be given a rifle rested on the support to aim for himself and transfer the picture he saw on the paper. Now, differences occur. Some will draw more “free space” between the ring and the “bull’s eye”, and some will draw less. The relationship of the rear sight and the tunnel will be different from shooter to shooter. Also, when you ask them to say how clear they see the sights and the “bull’s eye”, you will get different answers. Some will see the ring clear, some will see the ring and “bull’s eye” clear, and some will not see anything clear. Many shooters wear glasses, lenses or use a glass attached to the rear sight so poor vision is not a problem for good sight alignment.

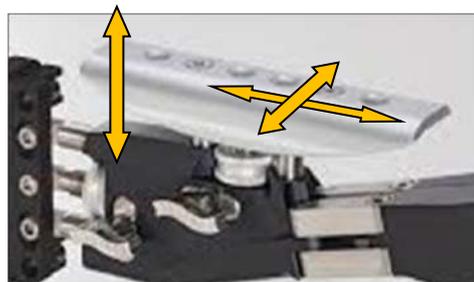
In order to explain sight alignment to the shooter easily, we must have certain parameters.

These are the “free spaces” between the iris aperture and the tunnel, and between the ring and the “bull’s eye”. At the beginning, the gap between the iris aperture and the tunnel should be $\frac{1}{3}$ of the tunnel width, and the gap between the ring and the “bull’s eye” should be $\frac{1}{3}$ of the “bull’s eye” width.



When the shooter adopts the way the sights are situated concerning the target, he can practice aiming while in the position.

The next very important task for the shooter and coach is to position the cheek piece so that the eye is in the aiming line. The head should be straight as much as possible and the neck muscles relaxed. The use of modern cheek pieces that can be adjusted in all directions will make this job much easier.



Every slight head movement during the final phase of aiming leads to errors on the target, and the shooter rarely notices these. Therefore, follow through is extremely important so that

the shooter checks the position of the head, in addition to recoil of the rifle. In that way the shooter dispels the suspicion whether the mistake was made due to the movement of the head or something else.

SELF - EVALUATING QUESTIONS:

In what relation should be the ring and the ``bull's eye``?

What are the main conditions for proper aiming?

2. SIZE OF THE RING AND OPENING OF THE BLEND

Size of the ring

As previously stated, the size of the ring largely determines the aiming accuracy.

Several factors influence what size of ring to choose.

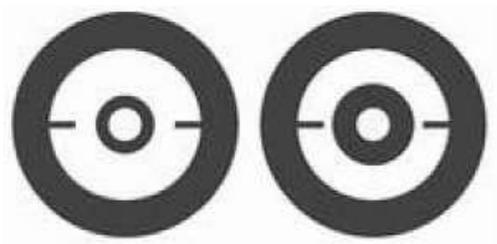
The size of the ring depends of the movement of the rifle and size of the holding area.

For beginners, adopting proper aiming and coordination of aiming and triggering is more important than good precision. At the beginning, the ring should be larger because the rifle moves more and the shooter is not able to concentrate on triggering because the “bulls eye” is not in the ring all the time and he has to “hunt” for it. As the shooter improves his holding skills, the size of the ring becomes smaller.

For the prone position where the rifle is relatively calm, a smaller ring is used compared to the standing position, and for the kneeling position it is somewhere in between.

In air rifle events, the usual values range **from 4.4 mm for beginners to 4.0 mm** for experienced shooters. This rule applies to paper targets. When shooting at electronic targets the size of the ring can be reduced **by up 3.8 mm** due to better contrast of the target, so the “bull’s eye” is more clearly visible.

In small bore events, specific ring sizes are not able to be set because the length of the aiming line varies from shooter to shooter. Most shooters use tubes of different lengths so the size of the ring also varies.



The thickness of the ring also affects the aiming accuracy. Many think a thicker ring is better because it is more visible. This is not case. The clarity of the

gap between the ring and the “bull’s eye” is much better with a thinner ring. When using a thicker ring, the shooter unconsciously focuses more on the ring than on the gap.

In the final aiming sequence, the focus on the gap is the most important for the accuracy of aiming therefore **a thinner ring is recommended.**

Lastly, the predominant factor for setting the ring size is the group of shots. The shooter can be satisfied with the ring size only when the group of shots is the same as it should normally be. The light conditions and contrast of the target are different at every shooting range, but the shooter’s form on the day also affects the ring size.

Taking into account all the above factors, the shooter must be familiar with them first, and then learn how to apply them in practice in the best way.

Opening of the blend

Opening of the blend has to allow the shooter to see the gap between the ring and the “bull’s eye” clearly.

The question arises as to how to explain to the shooter what the correct image is.

The simplest explanation is as follows:

When the opening is smaller, less light reaches the eye and a shadow appears inside the ring.

Visually, the gap between the ring and the “bull’s eye” is reduced and not clear.

If the opening is too big, too much light reaches the eye and the correct shape of the ring is lost. Visually, the ring becomes thinner and unclear, the gap appears bigger and the shooter has problems centering the “bull’s eye” in the middle of the ring.

The shooter’s advice is before starting to shoot, turn the blend until he gets the clearest picture of the gap between the ring and the “bull’s eye”. In case he cannot achieve this, filters should be used to get a clear image if the target is too bright or dark. If the target is too

bright, various shades of gray filters are used. If it is dark, a yellow and green filter is used.

Sometimes shooters use the polarizer and the green filter to reduce the glare of the target.

Under normal light conditions the diameter of the iris aperture is usually 1.0–1.3 mm.

Some shooters like to open the blend wider so they can see more space around the target, especially under wind conditions or if the background behind the targets is dark. In that way they feel more comfortable and safe. They should be very careful because opening the blend too wide leads to errors in head position.

SELF - EVALUATING QUESTIONS:

How the size of the ring affects the aiming accuracy?

How to properly adjust the opening of the blend?

How to choose the size of the ring regarding the length of the aiming line and the movement of the rifle?

3. APPROACHING CENTER OF THE TARGET

One part of this chapter has already been dealt with in the Theoretical part. The conclusion is that the approach to the center of the target should be from the same side and in the same way.

The direction of approach to the center of the target in all three positions is also processed.

We will now encounter the way of approaching the center of the target and the errors that occur.

The question is whether the approach to the center of the target should be fast, slow, steady speed or variable speed.

Although this is quite an individual matter, there are certain recommendations that should be followed. For the simpler explanation we will separate the approach in the wide aiming area and the approach to the final aiming area. Final aiming area is different between the positions. In the standing position it is the middle of the black circle of the target and in prone and kneeling position it is around the 9-ring at the target.

The separation of the approach to the center of the target is directly related to breathing and relaxation of the position. This will be the topic in one of the following chapters.

In general, there are two ways to approach the target center:

- Approach with constant speed through all the aiming area;
- Approach with variable speed. Approaching is faster in the wide aiming area and then slows down when entering the final aiming area.



Constant speed



Variable speed

In both cases the approach speed should be such that the shooter can control the movement of the rifle at all times.

Usually, the first way is used by shooters who have shorter aiming time and who pulls the trigger on the “first picture”. The second way is used by shooters who aim longer and like to make sure they are well aimed.

The biggest problem with the coach occurs when you need to control whether the shooter always has the same approach to the center of the target. Without the use of optoelectronic devices this is extremely difficult. The coach is forced to rely on the information he receives from the shooter, and it is very often not objective.

As this topic is extremely important for achieving high results, the use of optoelectronic devices is fully recommended at almost every training session.

Errors that occur due to different or incorrect approach to the center of the target

Irregular approaching direction – in most cases the aiming point will be outside the center of the target on the side from where the approach is. Usually, the shooter is trying to move the rifle by force to the center, but when he focuses to the final aiming area the rifle will move back to the previous position.



Too fast approaching – the approach of the rifle is out of control and will cross the center of the target which is not good. The shooter must engage the muscles to bring the rifle back to the center and thus disturb the balance and relaxation of the position. The aiming time is also extended.

Too slow approaching – the shooter prolongs the aiming time which leads to eye fatigue and distortion of the aiming picture. Shooters who shoot in the “first picture” may have a premature pulling of the trigger because they are trained for shorter timing.

SELF - EVALUATING QUESTIONS:

What is the recommended approach angle to the center of the target in Prone position?

What is the recommended approach angle to the center of the target in Standing position?

Which basic requirements need to be met for a correct approach to the center of the target?

4. GRIP AND GRIPPING

If we go back to the first part of the course where we talked about positions, or in the second part where aiming and triggering are dealt with, we will see that in many places the right hand and the grip are mentioned. Sufficient pressure of the butt plate in the shoulder depends on the distance between the grip and the butt plate; the position of the index finger on the trigger blade is predetermined by the position of the grip; the right hand holds the rifle and stabilizes and controls the movement of the rifle.

All this leads us to the conclusion that the shape and size of the grip is extremely important. The shooter should, on one hand, feel the comfort of the hand on the grip, and on the other hand, feel the firmness and safety in holding and controlling the rifle.

Today it is much easier to find the right shape and size of grip. Newer models of rifles or stocks have the ability to change the grip, so the shooter can find the most suitable for his hand.

They are produced in different sizes as well as with the possibility of 3D adjustments.



The size of the grip is determined so the middle phalanges of the fingers of the right hand are at an angle of 90 degrees to the axis of the barrel. In this case the hand grip is transferred straight back and there is no lateral movement of the rifle during firing.

By rotating the grip along the vertical axis and moving back and forth, the shooter should



position the grip so that the right wrist is straight, that the index finger rests correctly on the trigger blade and there is free space between the index finger and the grip. Also, in order for the index finger to be parallel to the axis of the barrel, the grip should be in the upper position as much as possible. In addition to the correct

position of the index finger, the shooter is better able to control the movement of the rifle and the recoil.

In the standing position, the handle is in line with the left shoulder. According to the rules, it must not touch the left half of the chest. The biomechanics of the position require that the rifle be above the center of gravity of the body, which in many cases leads to touching the body with the grip. The solution is simple. The grip should be cut from the side that is towards the body. The length of the grip should allow adequate contact with the palm so that the unused part can be freely removed to avoid violating the rules.

In order to improve the feeling and comfort of the palm on the grip, many shooters resort to



finishing the grip with special mixtures. In the case of an air rifle, the central part of the grip is usually also filled so that the entire surface of the palm rests on the grip. When finishing the grip, attention must be paid to the rule that the grip must not be anatomically shaped.

The situation is quite different with a small-bore rifle.

Restrictions in the shape of grip do not exist, so individual shooters use an anatomical grip or hand rest.

The hold that the right hand has on the grip should be firm but also must allow for correct triggering. This is a problem for many shooters because a hard grip obstructs the index finger, but a weak grip causes uncontrolled recoil of the weapon. The shooter has to find the middle value of the grip which will allow correct triggering and control of the rifle during triggering.

The grip strength should be constant throughout the shot process. It should also be unconscious, that is, automatic. The basic mistake that shooters make is to loosen the grip when they enter the final phase of aiming and triggering. This leads to different recoil of the rifle, and thus errors. This can be prevented by physical exercises to strengthen the forearm muscles.

There is also a noticeable difference in grip strength between positions. In standing position, the grip is tighter rather in prone and kneeling position where the grip is a little more relaxed. Usually this can be seen by the position of the hand on the grip.

SELF - EVALUATING QUESTIONS:

What are the basic requirements for the correct position of the grip?

How strong the grip should be held depending on the shooting position?

5. AIMING - BREATHING COORDINATION

In the theoretical part of the course, aiming and breathing are treated as individual elements of the shooting technique. It has also been repeatedly emphasized that only good coordination of all four elements of the shooting technique can achieve success. Coordination between aiming and breathing is one of them.

When we talked about approaching the rifle to the center of the target, it was said that the approach was directly related to breathing.

In order to better explain the connection, we need to remind ourselves of the way to breathe properly.

In order to fire a single shot in optimally quiet conditions, shooters usually take 2-3 breaths and then slowly and incompletely exhaling before stopping the breathing process.

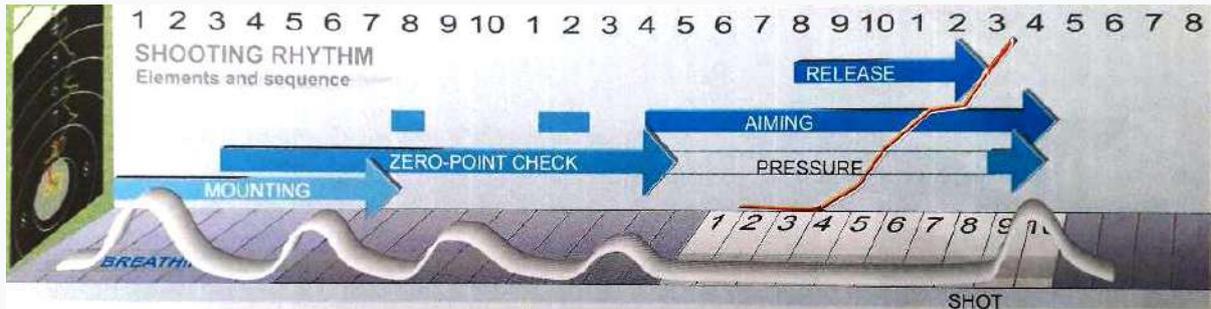
In order to make the most of breathing for position relaxation and mental preparation, each subsequent inhalation should be smaller and the exhalation slower.

Stopping breathing should not be on command, but natural.

During the last 2-3 inhales and exhales, the shooter checks the zero point. The rifle should move in the area specified as the correct approach direction to the center of the target. The shooter is not yet fully focused on aiming. During the last exhalation, the shooter focuses on aiming and controlling the approach of the rifle to the final aiming zone. When there is a breathing pause, the shooter is maximally focused on aiming, so that only by finally relaxing the position, he brings the rifle to the center of the target.

A critical point in the coordination of breathing and aiming is stopping breathing. Therefore, I emphasize once again that **stopping breathing must not be on command but smooth and natural.**

This process is very nicely shown in the chart that Heinz Reinkemeier published in his book "Air rifle - Training and Competition".



The way of breathing and the length of aiming are an individual matter for each shooter. The most important thing is that this process is carried out in the same way and in approximately the same time interval.

The rhythm of shooting and the time of triggering are directly related to the coordination of aiming and breathing.

6. DETECTING CRITICAL POINT BASED ON SHOT GROUP

In the shooting sport, the group of shots on the target is the basis for drawing conclusions about how the shooting technique is performed, and what errors occur. In order to correct mistakes, the coach needs to know how to "read" groups of shots and make corrections based on that.

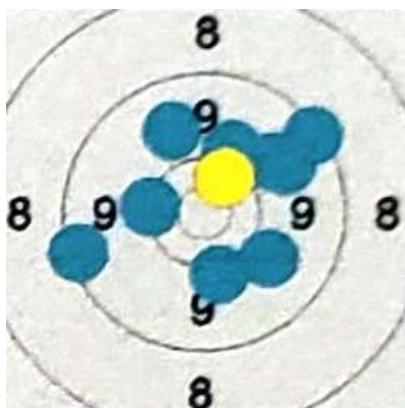
This chapter describes some of the most common types of shot grouping, which are caused by some of the typical technical errors.

In general, shot groups on the target can be divided into two types:

1. Shot groups that differ in size, shape and location where shots are located in relation to the center of the target;
2. Compact shot groups with individual shots that are outside the group.

Type 1

The shot group is round, but too big. A common mistake which is characterized by

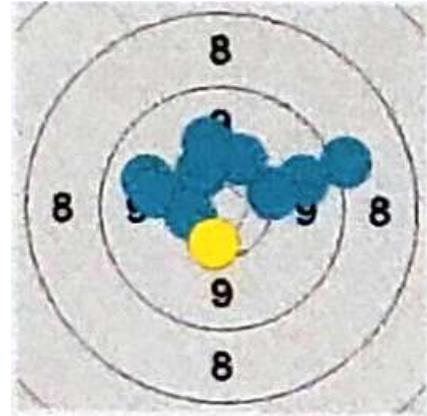


technically very well-executed shots, but a significant number of them end up very near the center, resulting in a lower level of series points. To correct this error and improve accuracy, the shooter should reduce the size of the front sight. If the aiming picture is good then it is most likely a mistake in the slower pull of the trigger. The

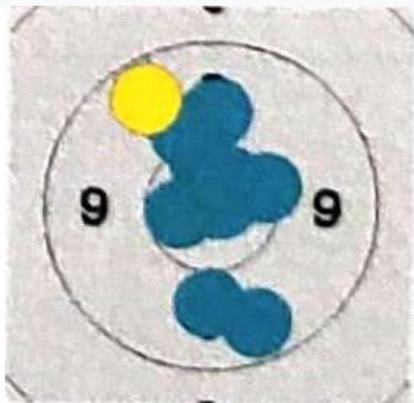
shooter must practice to execute the triggering technique with more confidence, without hesitation.

Dispersion of shots is greater horizontally. This group shape is mainly seen in insufficient balance of the system shooter-rifle in all three positions.

This most often occurs in the standing position if the COG is moved too much to the front leg. The hips are not fixed well and lateral movement of the rifle appears. To correct this type of mistake, the shooter should adjust the position of the feet and check that the hips are straight towards the target.



Dispersion of shots is greater vertically. This group shape is mainly seen in insufficient

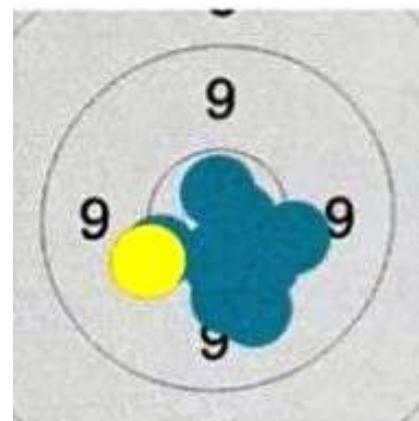


balance of the rifle. It could also happen if the COG is closer to the back foot so the shooter does not have good elbow support. Usually, the length of the stock is not set well or too much weight is placed on the front of the rifle. To correct this type of mistake, the balance of the rifle and the position of the COG should be adjusted correctly as it

is explained in Course No 1.

The center of the shot group is not in the center of the

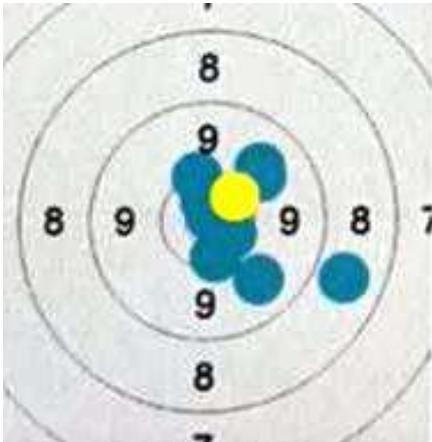
target. This error can lead to significant loss of points especially in disciplines where decimals are fired, such as air rifle and 60 prone. The cause of the error is untimely adjustment of the rear sight. It most often happens with less experienced shooters who do not pay much attention to the



position of the group of shots but only to each individual shot. Shooters should be taught from the beginning to move after each shot and monitor whether the group of hits is in the center of the target.

Type 2

The large mistake appears to the right side. This is one of the more common mistakes,

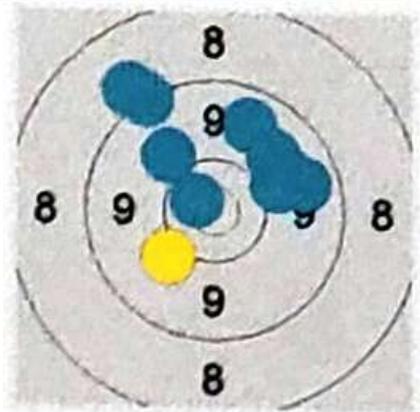


especially among beginners but can also be seen with top shooters, especially in extremely stressful situations. In both cases there is a triggering error (jerk), but the reasons are different. With beginners, this error occurs mainly due to attempts to "hunt the ten", while with top shooters it occurs for one of the following reasons: the first is uncontrolled pull of the trigger, due to mental

misdirection/distraction; the second reason is that the shooter "missed" the optimal triggering time and entered the fatigue zone, resulting in uncontrolled second triggering stage - snatching. The only solution to avoid such mistakes is for the shooter to abort the shot and repeat the complete procedure.

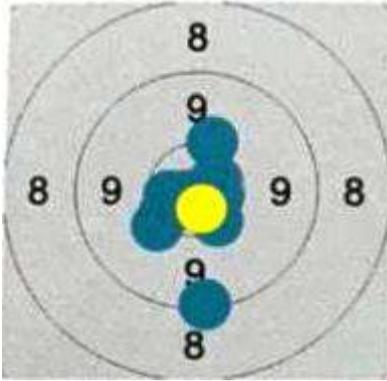
Mistakes occur in the upper left direction. This is another common mistake with all shooters

regardless of the level of preparedness. In most cases, shooters do not notice it, especially if they do not have good retention. At the moment of firing, there is not only a movement of the index finger on the trigger, but also an uncontrolled movement of the left hand, which leads to an error at 10-11 o'clock. Also, in the kneeling and prone



position, the same mistake occurs due to the movement of the right shoulder in response to the recoil of the rifle. The mistake is more common and more pronounced in stressful situations. The solution to the problem is in good preparation for each shot. The procedure of processing the shot must be fully followed, where the relaxation of the left arm, shoulder and back is one of the most important factors.

Mistake is at 6 o'clock. This error most often occurs when triggering. In addition to pressure



of the trigger with the index finger, the shooter also squeezes the grip.

Inexperienced shooters want to reduce the recoil of the rifle, thinking that this increases the accuracy of the shot, which is completely wrong. To correct this type of mistake, gripping must be the same every time so as not to affect the

movement of the index finger and the recoil of the rifle.

Mistakes that occur in the direction from bottom-left to top-right. Wrong position of the

index finger on the trigger leads to errors diagonally as shown on the target. If the trigger blade is too far, the index finger puts pressure on the trigger to the left and errors occur on the 8 o'clock. Otherwise, when the trigger blade is too close there are errors on 2 o'clock. The basic rule must be followed in order to avoid these mistakes is to place the first phalanx of the index finger at 90 degrees in relation to the axis of the barrel.



SELF - EVALUATING QUESTIONS:

Describe, and give a solution for your shooters' shot grouping on the target.

What mistake shooter does if the shots are grouped at 10 o'clock?

7. DETECTING CRITICAL POINT BASED ON RIFLE RECOIL

In the previous chapter, we discussed how groups of shots show how the shooting technique is performed, and what errors occur.

Another very important indicator of the performance of shooting technique is the recoil of the rifle. Spotting mistakes with incorrect rifle recoil is a bit of a difficult task for a coach. It is more noticeable, and when the coach works with several shooters, it is almost impossible to follow every mistake. Therefore, the use of optoelectronic devices is the best way to detect them.

Young shooters, especially when they switch to small bore rifle disciplines, believe that the recoil of the rifle leads to mistakes. They try to compensate by force which leads to real mistakes. Therefore, we will dedicate the next few lines to the recoil itself.

After the trigger is pulled, energy is released in the form of compressed air or gunpowder gases, which causes the bullet to fly out of the barrel. The released energy not only acts on the bullet but also pushes the rifle in the opposite direction - towards the body of the shooter with the same strength. Since the body of the shooter resists this movement, the rifle jumps upwards because there is no resistance in that direction. The recoil of the rifle depends on the caliber, weight and speed of the bullet, the length of the barrel, the compensator in the air rifle. The recoil also depends on the constitution of the body and the firmness of the position. The rifle recoil should be viewed in two parts: the rifle jump as a physical reaction and the follow through as a technical characteristic of the shot process.

The most common mistakes based on rifle recoil will be described.

For easier understanding, the Scatt training system is used to display the rifle recoil. The red trace represents the movement of the rifle after firing.

To make it easier to spot and explain the mistakes that occur, it is first necessary to see what a good rifle recoil looks like.

Air rifle



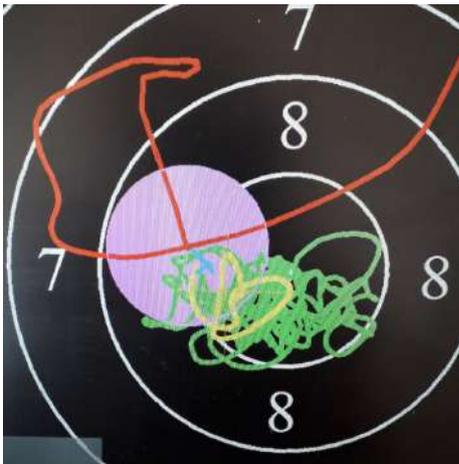
SB rifle - Standing



These pictures show an almost perfect recoil of the rifle. The jump is straight and vertical. The return of the rifle is at the same place or near the starting point of the recoil. If the rifle does not return near the starting point, then the problem with follow through has occurred. In air rifle shooting, the jump is short which means that the compensator is well tuned mechanically. The maximum recoil height should be by the middle of the 7th circle. A bigger jump shows that the parameters of the rifle (compensator, speed) are not well set.

In the cases shown below, air rifle shooting was used to demonstrate the different rifle recoil. The same rules also apply to small bore rifle shooting.

Case 1



Recoil is diagonally to the side. The recoil of the rifle continues in the direction of the movement of the rifle that occurred in the last phase before triggering (yellow trace). This means that the balance of the position is not set well. The shooter is not stable during the final aiming procedure which led to an error. The recoil to the side increased the error even more.

Case 2

The recoil begins to the side. The recoil of the rifle continues in the direction of the movement of the rifle that occurred just before the trigger is released (blue trace). This mistake appears when the shooter does not pull the trigger smooth and clear. It can be seen that the shooter tried to compensate for the shooting error, but he was late.



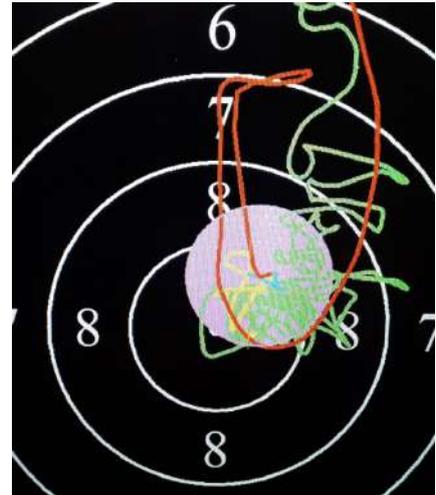
Case 3



The recoil has returned to the aiming area during the follow through. The zero point of the position is not set well so the shooter has pushed his rifle up to the center. The recoil trace returns to the center of the aiming point, and in the most cases the shot coincides with that point.

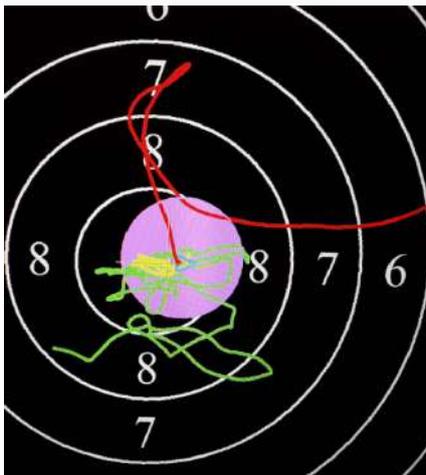
Case 4

The recoil is bigger than it should be. There are a few reasons why this has happened. First reason could be due to a mechanical problem in the rifle. This happens when the speed of the pellet is increased or the compensator does not work properly. Next reason is a weak position or gripping is too soft. If the recoil trace returns below the final aiming area, in most cases this reason appears.



Finally, it could be happened if the balance of the rifle is too far back.

Case 5



The shooter does not have the follow through. If the recoil trace does not return near to where it started, the shooter has a problem with the follow through. Much has already been said about the importance of follow through in the chapter "Aiming and sighting technique".

SELF - EVALUATING QUESTIONS:

Describe, and give a solution for your shooters' recoil of the rifle.

8. CORRECTIONS OF THE MOST COMMON MISTAKES

Some of the most common mistakes have already been mentioned during the first and second course. We will now unite them together with tips for their correction.

We can divide all of them into errors in: position, aiming and triggering.

Shooting positions

Standing position

The position of feet does not provide good balance and stability of the position. If the COG is moved slightly forward, the hips are not fixed well and the rifle will move more horizontally. If the COG is toward the back, the left hip is going down and does not provide the shooter with good elbow support, so the rifle will move more vertically.

The shooter should distribute the weight so that the movement of the rifle is as small as possible and the group of shots is more circular. The balance of pressure can be checked by the measuring platform or two scales. These can also follow the changes of pressure during shooting. While the shooter is in the position, it is good to close his eyes and concentrate on the feet and legs. This is the easiest way to find the position where the pressure is equally balanced on the toes and heels, and to relax the leg muscles.

The balance of the rifle is not set well. The balance of the rifle should be around the point where the rifle rests on the hand.

The shooter can adjust the balance of the rifle very easily by placing or moving weights front and back. Also, the balance of the rifle can be adjusted by changing the length of the stock.

The hips are not straight towards the target. If hips are turned to the side, there will be unequal pressure on the feet. The muscles of the back are tense and will tire faster.

When placing the feet and adjusting their angle, the shooter needs to consider the best possible angle to ensure optimal hip alignment. Keeping the left foot at a 90-degree angle and opening the back foot can facilitate a consistent and straight hip alignment. Some shooters also choose to close the left foot to reach the same goal. The coach should often control the position of the hips by watching the shooter from the back.

Only the lower part of the butt plate leans on the shoulder (air rifle). The butt plate should be lowered so that it leans at least 5-10 cm on the shoulder. The check can be done while the shooter is in the position and the coach tries to move the upper part of the butt plate left-right. If the rifle butt turns easily, the contact is weak and the area of contact between the butt plate and the shoulder should be enlarged.

The pressure of the butt plate on the shoulder is also critical. It goes without saying that the pressure on the shoulder should be the same as the pressure of the butt on the left arm, but the important question is where the pressure is coming from. The pressure must not be the result of active muscle tension, the shoulder pushing forward towards the butt or drawing the butt on the shoulder by the right hand. The correct way of pressure is the right choice of the length of the butt, that is, the distance between the butt plate and the grip. The correct distance allows the relaxation of the right arm, and lowering of the elbow passively bringing the shoulder forward which allows the needed pressure. The correct length of the butt can be determined by putting the butt plate at the curve of the right arm elbow when it is stretched. When the forearm is bent, the hand should be on the grip and the index finger should be correctly placed on the trigger. If the pressure is weaker, the butt plate should be drawn out and vice versa, but it should be bore in mind that the relaxation of the right arm causes the stronger pressure.

The left elbow is not in the same place on the hip for each shot. During the procedure of taking the position, the shooter must be careful to always place the elbow in the same place. In order to correct this mistake, he can initially mark the correct position of the elbow on the jacket. During training, the feeling of the position of the elbow on the hip will be automated so that the need for marking will disappear. Training in front of a mirror is a great way to practice placing your elbows in the same place. Also, the coach can check the correct position of the elbow and forearm by looking at the shooter from the front.

The left shoulder and arm are not relaxed. All the muscles of the left shoulder, hand and arm have to be relaxed in order to prevent shaking and movements during triggering.

Very often, especially beginners, do not recognize whether their left arm is relaxed or not. By contracting and relaxing the biceps of the left arm, they can very easily feel the difference between muscle tension and relaxation, and remember that feeling. A lot of shooters, even those with experience, make the mistake by not relaxing the left shoulder straight down, but backwards. When taking a position, always keep the same space between the left shoulder and the rifle.

In order to correct these mistakes as fast as possible, the coach should constantly warn the shooters about the relaxation of the shoulders, left arm and back.

Prone position

Insufficient contact of the butt plate in the right shoulder. The contact of the rifle and the shooter's body in the right shoulder has to be firm. The rifle should be as close to the neck as possible because of the better head position.

While the shooter is in the position, the check is performed when the coach holds the upper part of the butt plate and moves it left-right. If he cannot move it, the firmness is good. The shooter himself can also perform the check while still in the position, when he tries to turn the

rifle with his left hand. If he finds the movement difficult to perform and the rifle returns to the former position, the contact is good.

Correction could be done: by the rotation of the whole body toward the target and not moving the left elbow; by making the butt longer; by moving the hand stop forward; or by tightening the sling.

The position of the left elbow and the rifle. The position of the left elbow is extremely important because its correct position gives the greatest stability to the rifle. If the elbow is far left, dropping and jumping of the rifle to the right side occurs. If it is too close to the rifle or under it, the rifle can be in a position that is not allowed (the grip must not touch the left arm), or irregular jump of the rifle to the left occurs.

The check whether the elbow is correctly positioned or not, the coach can push the top of the barrel down and releases it abruptly. In the correct position, the barrel will go directly down and return to the former position. If it goes to the left, the elbow is far to the right and vice versa. If the barrel returns above the target, the elbow is far forward. If the barrel stays below the target, the elbow is too close to the body.

This check is also used for the firmness of the position. That is, to check the tightness of the sling and the contact of the rifle and the right shoulder.

The position of the right elbow. Only in the prone position the right arm is resting on the floor, thus influencing the stability of the rifle, more than in the other positions.

To check whether the elbow is correctly placed or not, we can perform by the spirit level. If the elbow is closer to the body, the rifle will turn to the left. If the elbow is away from the body, the rifle will turn to the right. It is also good in the beginning if the coach marks the position of the elbow on the floor. He keeps warning the shooter when he does not place the

elbow correctly until the shooter adopts the position and automatically places the elbow at the same place.

Moving the sling on the left upper arm. Especially when the shooter does not have a quality jacket or it is not made to measure, the sling moves during shooting and thus the position relaxes. The shooter should periodically adjust the sling to its original position to maintain the same strength of the position for each shot.

Kneeling position

Inadequate size of the roll. The shooter sits on the heel of the right foot. Under the foot he can place a small pillow up to 25 cm long and with the diameter of up to 18 cm. Since almost complete weight of the body is on the right foot, the ligaments are stretched at the joint and it causes pain. Because of the different sizes of feet, every shooter individually has to adjust the size of the pillow to his foot. If it is too small, the stretching of joint ligaments is greater which causes strong pain and the shooter may fall backward. If it is too big, it causes the instability of the position because the axis of the body is high. The size of the roll must be carefully determined depending on the size of the foot and the flexibility of the joint.

Wrong position of the right foot. The foot is normal to the floor or a little aside from the target and leans on the middle of the pillow or a little closer to the target. When sitting on the heel the shooter must check the position of the right foot. If he notices that he is falling backwards, it is most likely that his foot has rotated to the right and the mistake must be corrected immediately.

Insufficient contact of the right knee with the ground. During shooting, there may be a slight movement of the knee, which leads to a change of the zero point horizontally. The position of the right knee also tightens the left leg, through the trousers. It has recently been noticed with some top shooters who are excellent in the kneeling position (Debevec, Miroslavljev,

Pletikovic) that they do not lean the knee onto the floor. It is rather atypical and should not be practiced when teaching shooters how to assume the kneeling position.

The left shin is not vertical. The weight of the rifle should be directly transferred through the left arm and shin to the heel, or a bit in front of it. My experience of a good left leg position is the pressure felt exactly on the heel, which means that the axis of the rifle is on the area of support.

The back is not totally relaxed. The relaxing of the left arm and the shoulders can be learned by training prone and standing positions. The back is most important being relaxed for the kneeling position. It is best learned when the shooter assumes the position without the rifle, closes his eyes and is concentrating to relaxing the back muscles. Then, the same is done with the rifle before placing the head on the cheek piece and starting to aim. This should be done every time the position is assumed and before every shot until it becomes a subconscious activity.

Errors that occur with insufficient contact of the butt plate and the right shoulder as well as the movement of the sling are resolved in the same way as in the prone position.

Errors in holding the grip and how to correct them are dealt with in the chapter “Grip and Gripping”.

General advice for position problem solving:

- Always start with the so-called school position with beginners. Through training, practice variants depending on the body construction and the affinity of the shooter;
- By closing the eyes after assuming the position, control the inner feeling of the position;
- The coach has all the time to point out the need for the relaxation of some muscle groups mentioned above;

- Dry training. It is free, but helps a lot, and it can be done at home. While dry training, the shooter is not under score pressure so that he can absolutely concentrate on the shooting technique. It should be practiced every day, at least for 30 minutes. Aiming at a point on the wall from a short distance should be used for the practice of calming the rifle, as well as training in front of the mirror in order to practice assuming the same position every time. Dry training also contributes to the improvement of the specific physical fitness and adoption of the shooting technique up to the automatization;
- Training with ammunition should be practiced with group shots (several shots at the same target) when done for the improvement of the position, or at a training target without circles.

Aiming

The pressure and the position of the head onto the cheek piece is not the same. The position of the head has to be such so that it allows the comfortable position of the head, and the eye is in the aiming line. The pressure of the head to the cheek piece should be the same for each shot. If it is not, different recoil of the rifle will occur. The most frequent errors occur if the head is not in the same position all of the time. There are a few options to solve the problem. Many shooters just touch the rear sight aperture with the eyebrow or eyeglasses so that they have a parameter and always place the head at the same place. Some shooters touch the right hand thumb with the tip of the nose in the prone position. The best control so that the head is at its place, is that the gap is always the same between the rear sight and the tunnel, which the shooter has to check in the beginning of the aiming process.

Errors related to ring size and opening of the blend are addressed in the chapter “Size of the ring and opening of the blend”.

Also, errors related to approaching center of the target are addressed in the chapter “Approaching center of the target”.

Triggering

Incorrect position of the index finger tip on the trigger blade. At the beginning of the triggering process, the shooter must check that the position of the finger on the trigger is always the same. The task of the coach is to check the position of the finger on the trigger, and if necessary warn the shooter. If the conditions for proper pulling of the trigger are not met, make adjustments to the position of the grip or trigger blade.

Prolonged triggering. Prolonged triggering is a very common and complicated error. Once adopted, it is quite difficult to correct. To solve the problem, training should consist of practicing firing at the “first image”, shooting at a faster rhythm, or shooting at a faster rhythm from the support.

Pulling the trigger is not smooth and clear - “hunting” the ten. “Hunting” the ten causes the worst scores because it is regularly connected to the trigger jerk. Since triggering is rather easy, between 50 and 100 grams are needed for the shooter to get the feeling of the triggering weight. It is best to use dry training in a dark room where the shooter will be concentrated to triggering only. In the first part of training, he should practice only withdrawing of the first leg so that it does not cause firing. After that he turns to gradual withdrawing of the other leg again without firing, until the shooter gets the feeling of how much pressure he can produce onto the other leg. Finally, he performs complete triggering, paying attention to both stages.

The next stage is dry training on white paper or on the wall. The shooter is concentrated only on triggering that he should perform so that while pulling the trigger the weapon does not move. Later he does the same with a bullet. Some shooters are particularly afraid of firing and rifle jerk especially while shooting with the small caliber rifle. Spasm of the right hand

may occur during firing when trying to prevent the jerk. In order to avoid this shooter should use ear protection and train. The coach will load either a bullet or cartridge into the barrel while the shooter does not see. In that way the shooter will try to pull the trigger the way he practiced while having dry training.

In the end the accord of aiming and triggering comes. The training is organized by group shooting so that the shooter is concentrating only to these two elements, not on the score. The shooter who pulls the trigger too fast should use autosuggestion. During aiming he should keep repeating to himself “take it easy, slow down”. He will then perform the triggering at the right moment. It is especially important during training that the shooter learns to delay firing. To achieve such self-control and be able not to fire if the time for firing has passed or if he did not aim well. It is good that the coach suggests to the shooter when the triggering time has passed.

Every uncertainty in assuming the correct position, or appearance of some outer factors that disturb the shooter’s concentration, has to cause a delay in triggering, breaking or laying down the rifle.

SELF - EVALUATING QUESTIONS:

Which are the most common mistakes in the Standing position?

Which are the most common mistakes in the Kneeling position?

How to solve the most common mistakes in the Prone position?

9. TACTICS IN SHOOTING

Sports tactics is the art of fight (L. Matveev, 1977, p. 129). Sports tactics include purposeful ways of managing the condition of the athlete, which is directed towards a certain idea and plan for achieving the competitive goal.

Sports tactics is a well thought-out and prepared plan of activities in advance that enables the successful use of their individual technical, motor and mental abilities and characteristics, with the aim of winning a sports competition.

Tactical preparation of athletes involves developing the abilities of athletes, in order to know how to manage the partial effects of competition to achieve a good sports result. Tactical preparation enables athletes to acquire and adopt certain knowledge related to the competition process and thus more efficiently manage and regulate their actions, depending on the course of the competition. **It is a process that includes not only training units, but all necessary arrangements** (traveling, accommodation, pre-event training) and necessary evaluations and analysis prior, during, and after the competition.

Tactical preparation for the competition begins weeks prior to the competition.

TRAINING PROCESS BEFORE THE COMPETITION

Tactical preparation can be divided into general tactical preparation and tactical preparation for a particular competition.

General tactical preparation

General tactical preparation is an integral part of any technical training, especially in the Competition period. The shooter needs to learn how to "guide" himself through the match in

order for all his technical and psycho-physical qualities to get the best result. It refers to the observation of critical points in the shooter during training sessions and their corrections.

Analyzing the training sessions, certain regularities are noticed when critical points appear, such as: drop in concentration, fatigue, a problem of firing the first shot or the last shot in the series. Based on these indicators, an "agreed tactic" is made which will be applied at the competition.

The coach should also teach the shooter what measures to take in case of unforeseen circumstances that may arise during the competition - "situational tactics". Unforeseen circumstances may be related to the shooting itself - poor hit, drop in concentration, bad feeling in the position, weather conditions. Or, of a technical nature - failure of the electronic target, failure of the rifle, obstruction of the shooter by a neighboring shooter, audience or media. Taking breaks at the right time is the key to success. Depending on the type of problem, the pauses vary in length and whether the shooter is in position or the shooter exits the firing line.

Some examples of practicing shooting tactics:

1. Firing sighting shots. The purpose of shooting sighting shots is for the shooter to enter the match as ready as possible. Therefore, the probe is divided into three phases and each phase has its own function. In the first phase, the goal is to check the zero point, feel the inner position and settle the attitude. The shooter should not pay attention to the shots. The second phase serves to adjust the sights at the center of the target. The third phase is the final preparation for entering the match. In the first two stages, the shooter usually has a faster rhythm of shooting. In the third phase, the shooter should create a competition situation in his head and shoot the last few shots at full concentration and in the rhythm in which he will shoot the competition.

2. Simulating the psychological load as in a competition. By giving certain tasks, the coach can achieve an increased psychological load on shooters and thus better prepare them for the competition. Here are some examples of air rifle shooting:

Each training should begin with warm-up and technical part. The goal value depends on the shooter's abilities. It should be realistic or a little higher.

- Training 1: S + 10x3 for 31,4 + 10x2 for 21,0 + 10x4 for 41,9
- Training 2: 30sh Th + 20x10,5 + 3x104,7
- Training 3: 30sh Th, 10' rest, S + Match – goal 628,0, 15' rest + Final
- Training 4: S + Barriers: 4x31,6 + 3x52,5 + 5x21,1
- Training 5: 40st Th, 7x10 goal 6x10.5 per serie

3. When it comes to situational tactics, taking breaks at the right time is the key to success.

Depending on the type of problem, the pauses vary in length and whether the shooter is in position or the shooter exits the firing line.

Tactical preparation for a particular competition

Information about the shooting range

The task of the coach is to obtain and present as much information as possible related to the conditions of the shooting range where the competition takes place. This primarily refers to the appearance of the shooting range, where previously taken photos and videos can be of great help. If the coach does not have this information, it is possible to search for them on the Internet or ask the organizer or an acquaintance from the place of the competition to send them. It is necessary to present the climatic conditions expected during the competition, as well as the specificity of the light both at 50m and 10m shooting range. It would be desirable to make as detailed records as possible during each visit to the shooting ranges so that they can be used at a given moment.

Training camp before the match

In order to train the most realistic elements that need to be implemented in the competition, the goals during the training camp should be adjusted to the main goal of the competition

Each shooter should have a reminder that contains all the basic things related to participating in the competition.

An example of the reminder

DAY BEFORE COMPETITION		COMPETITION DAY	
		Start number	
• <u>Shooting range</u>		Passport	
Floor, target high		Equipment control	
Target background		ID card	
Changing target		Binocular	
Light		Case with the weapon	
Wind		Shooting equipment	
Mirage		Glasses	
Temperature		Towel	
WC, Doctor		Drugs, documents	
Gunsmith			
• <u>Equipment</u>		COMPETITION	
• <u>Training</u>		Weapon control	
Weapon cleaning		Ammunition	
Sighting aperture		Weapon cleaning	
Light		Stop watch	
Wind		Chair	
Mirage		Targets	
• <u>Meeting</u>		Binocular	
Start number		Ear protection	
Starting time		Towel	
Shooting place		Glasses	
Wake up		Goal notes	
Breakfast		Tactics notes	
Transportation to the shooting range		Drink	
Goal		Food	
Tactics			

Travel preparation and accommodation

When it comes to travelling to international competitions, there are two models of preparation and a trip to a destination that takes a couple of hours and overseas travelling. In both cases, common elements are checking the possession and validity of travel documents, passports, visas, ticket reservations, the total weight of equipment, etc. It is also important to choose the optimal time of arrival at the destination, to provide optimal conditions for all activities that need to be done during the arrival day. Following the choice of the start of the trip, the time required for the procedures for leaving the country from which the trip starts should be planned. Upon completion of the arrival procedures at the destination, the time required for the transport and delivery of weapons to the shooting range, as well as obtaining accreditations for the competition should be taken into account. The next stage is the arrival at the hotel and all the procedures that must be done at the hotel. The result of the competition can also depend on the accuracy of travel planning.

When traveling to long intercontinental overseas competitions, special attention should be paid to the accommodation of athletes. Jetlag requires a longer period of recovery and adaptation, both physically and physiologically. Especially pronounced is a sleep disorder, which affects the overall functioning of the athlete. It is well known that long international flights to the east require a longer period of adaptation than when traveling to the west. It has been scientifically proven that the difference in time zones takes so many days for the body to fully adapt to the new conditions.

It is highly recommended to book a hotel that is recommended by the organizer of the competition, as transportation to/from the shooting range is included. Making a reservation in good time, is giving the possibility to choose one of the nearest hotels to the shooting range. The travelling schedule has to be tested during training days and finalized before competition day. Rooms should be reserved in the way that shooters competing in the same discipline will

be sharing the room, avoiding disturbance in sleeping time. At least, roommates should share similar daily sporting activities.

Activities at the competition site

- **ID –cards** - All members of the team, athletes, coaches, officials must obtain ID cards;
- **Start lists** - It is necessary to obtain information regarding start lists for PET and competition;
- **Pre-event training** - It is conducted on the same firing points as in the qualification round (competition). The start lists are published latest the evening before the competition, if not earlier;
- **Shooting Range** - Shooters, together with the coach should visit the shooting range and make necessary notes regarding conditions on the shooting range. This activity should be done on the first day upon arrival;
- **Equipment and weapon control** - Following technical rules, it is advisable to make technical control on the first day of shooting range visit;
- **The storage of the weapons and equipment** - Athletes should deliver their weapons and ammunition to the designated storage room, and collect information regarding rules for delivering and taking weapons and ammunition during competition days;
- **Targets** - Inspection of the targets and light conditions is part of the standard procedure. The location of the weapon and ammunition manufacturers, team room, bathroom and doping room, should be noted during the first-day visit.

DAY BEFORE THE COMPETITION

The Pre-Event Training is taking place one day before the competition, on the same firing point as in the competition, but seldom at the same time as the time for the competition.

Anyhow, the shooter should try to take advantage by getting familiar with the conditions and circumstances of his firing point as much as possible. He should check the floor (whether moving or sliding), the height of the target, the intensity of the light on the target and on the shooting range, and make corrections if necessary. Also, when shooting at 50 meters, the information regarding possible wind behavior could be beneficial in outlining the final tactical approach for the competition. After that the shooter should make proper adjustments of sighting elements so that the shot group is in the middle of the target.

The evening is reserved for a team meeting. All necessary information regarding wakeup time, breakfast time, shuttle bus schedule, the pre-competition routine, should be defined in its final form. Notes and information taken during PET are presented and analyzed. The final reminder of goal setting and tactics necessary for the competition are outlined and finalized.

DAY OF THE COMPETITION

Wake up time and choice of a meal are important elements of the competition day. These topics are in the responsibility of the specialists in those areas, and therefore will not be elaborated further in this chapter.

Tactics during the match

Final tactics are decided the last evening and should consist of two sets: The “agreed” tactic and “situational” tactical approach if conditions during the match are asking for it. Competition goals and various tactics have been subject to the training camps before the competition. Tactical routines regarding physical and technical warm up and mental preparation are carried out with regular routine. A list of performance goals in longer or “keyword” form has to be followed, as it was trained. In the case of some irregular situations appearing, the proper tactical solution should be engaged. All those various scenarios have been subject to training camp activities.

Analysis

Right after the competition, the coach should get short feedback from the shooter. It can be very worthy information on the emotional and psychological status of the athlete. The analytical discussion will take place later during the day, the latest in the evening during the team meeting. This procedure is very important, as usually during the international competition there is another match, sometime in the same event if there was an eliminations or second event. It means that work is continuing and analysis should be taken as preparation for the next start.

SELF - EVALUATING QUESTIONS:

Which is the tactical procedure on the day before the competition?

Which is the tactical procedure on the competition day?

When does a competition analysis needs to be done?

10. SHOOTING DIARY

Shooting diary is a tool to help the shooter to perform better. Also, the shooting diary is a tool to help the coach to coach better. This means that we have two types of shooting diaries that differ in the information they contain. Both types are dealing with a large amount of information, so there is a need for the optimal format of gathering this information and the system of using them. Keeping a shooting diary is one of the best ways to improve shooting scores.

Before we start elaborating the diaries, it should be said that the diaries contain personal information of the shooter or coach. Its content should be revealed to others only by consent from the shooter or coach. Some diary information can be used by both the shooter and coach, such as weapon setup changes and ammo selection. This information should be given in the case that the coach, for some reason is not able to access, or in the situation when a new coach is taking over the position of personal/national coach.

Shooter's diary

Very often a question is asked about what information the diary should contain. Most young shooters think that the basic info, like event, date, time, temperature, weather conditions, location and result are quite enough. Certainly that is not the point of keeping a diary. The main reason to use a diary is for feedback. It means that you have a written record that can tell you why you shoot good, bad or in between. That is the self-evaluation which should contain the shooter's feelings and thoughts before and during training / competition, such as: mood, nervousness, motivation, sense of inner attitude and performance analysis.

Diary records can be done on two levels - one for daily training purposes and one for the competition purpose.

Daily training diary, in addition to the above tasks, should contain the assignment set by the coach, its execution, any corrections to the elements of the rifle, shooting equipment or position and the volume of training (number of shots fired).

The diary written during competition should contain some additional information - the layout of the shooting range, the light at the shooting range, approximate correction of the sighting elements, etc. Furthermore, the shooter can use a diary to write down the time for the team meetings, shooting time, number of the firing position, transportation schedule to the shooting range, and equipment checklist.

The shooting diary plays a big role in the mental preparation of the shooter for the competition. By reading records from a competition or training session when he has achieved the best results, the shooter remembers that feeling and thus increases his self-confidence. This should be a routine before the competition itself.

Daily training and competition records should both contain the coach's instruction and evaluations.

Coach's diary

The coach's diary has a lot in common with the shooter's diary, but it also has its own characteristics. They are reflected in whether the coach is involved in individual work with one or two shooters or is involved with a larger group, such as working with a national team. Depending on this, the contents of the journal may vary. The diary must contain all the general elements needed for the group, the main strategic goal for the training camp, the timetable, the discipline division, etc. It must contain individual and collective description of the state of performance at the beginning, during, and at the end of the camp. Which individual

recommendations are given, as well as their effect on the shooter's performance. It must contain an individual and general evaluation and conclusion at the end of the training camp. Based on this information, a work program and goals for the next training camp are made.

Two examples are attached to the end of this chapter.

During the competition, we can freely say that the coach's diary is a supplement to the shooter's diary. The information obtained such as: groups of shots, rhythm of shooting, fulfillment of agreed tactics, mistakes that occur, and so on, help a lot in correcting mistakes and planning further activities.

Example 1

If we like to make a right choice witch shooter has to go to big competitions, we must look some parameters:

1. international results in last two years
2. results in competitions period after 1. January
3. form progression and results stability in period 2
4. dedication – number of practices, duration, seriousness and motivation

Analyze of results

Name	Average 1-6 2006NA	Average 2006 INT	Min.-max. 2006 INT	Average 11-12 06NA	Min.-max.	Place on ECH	Average 1-2 07	Min.-max.	Place on ECH
XXX	573.2	572	566-575	573.4	568-581	32	575.33	571-577	21
XXX	569.0	567.25	564-574	568.5	564-573	48	573	561-583	32
XXX	569.75	566.77	561-574	565.25	557-570	56	573.66	566-578	26
XXX	589	585	580-591	591.6	587-596	21	590.16	581-591	25
XXX	390.2	389.33	386-393	392.83	389-396	20	385.7	381-390	45
XXX	389.2	387	387	390.3	387-391	32	388.4	383-395	42
XXX				375.5	369-377	37	379.6	371-385	17

Average on national competitions is without one worst result.

Name	3	4
XXX	Go up and very good stability	Excellent in all parts
XXX	Go up, very bad stability	Very low, practice 1 per week, didn't practice two weeks after competitions for selection
XXX	Go up, good stability	Medium, had surgery after comp. for selection
XXX	Stay, bad stability	Very high, good on big competitions
XXX	Go down, bad stability	Medium, good on big competitions
XXX	Stay, very bad stability	High, psych. problems on big competitions
XXX	Go up every comp., good stability	Very high, hasn't international experience
XXX	Good stability on international competitions last years	Very high, real problem is no serious national competitions

PROPOSAL FOR WORLD CUP USA

Have to go:

1. XXX – air pistol and free pistol-he was in final on WC 2005 with 561 points
2. XXX – sport pistol-many times in finals on WC and 9th place on ECH 2005

Rang list of other shooters:

1. XXX
2. XXX
3. XXX
4. XXX
5. XXX
6. XXX

After ECH, I will make proposal for World Cups in Australia and Thailand.

Head Coach of National Team

Example 2

R E P O R T

From Asian Games, Palembang, Indonesia, 18. – 27. 08. 2018

Rifle shooting team of Iran participated in the Asian Games with 4 men and 4 women athletes.

We won one bronze medal – XXXX and five finals: one forth – XXXX, one sixth – XXXX and three seventh places – XXXX in both events and XXXX.

Athletes' results and ranking:

Name	Event	Result of qualification		Result of Final	Rank – Qualific	Rank in Final	Number of athletes	Result for final	Best result
XXXX	AR	623,1		/	12	/	44	624,5	632,9
XXXX	3X40	1164		406.0	4	6	32	1159	1174
XXXX	AR	625,7		141.4	6	7	44	624,5	632,9
XXXX	3X40	1155		/	12	/	32	1159	1174
XXXX	AR	626,2		141.8	5	7	46	624,0	631,9
	3X40	1163		400.6	4	7	33	1160	1175
XXXX	3X40	1162		441.2	6	3	33	1160	1175
XXXX	AR	624,7		206.3	6	4	46	624,0	631,9
XXXX	AR	413,5	828,4	/	7	/	22	829,8	836,7
XXXX	MIX	414,9							

Generally:

We can be satisfied with results that our shooters achieved, especially when we didn't have any one day of preparation outside of Tehran, not enough ammo and no tested ammo. Lower results in finals are expected because shooters never can reach that level of pressure in training like they have in competition. Some of them were in one or two finals in the international competitions in last two years and some of them no one. They need to go to some smaller international competitions to shoot finals and prepare for the biggest competitions. It's not expectable to be in all finals in World Cups to practice it. Sadaghat and Nekounam were first time in final in the international competition.

Individually:

XXXX fully satisfied with her performance and achievement. She still has some space to improve her result in 3x40 and to do that on WCH in Korea.

XXXX shows that she's a world class shooter in both events. She was under big pressure after gold medal in Munich as a main candidate for gold and she couldn't fight with that in finals. She is our most experienced shooter and I hope she will show that in Korea.

XXXX didn't was first option for 3x40 because air rifle is his better event but he shows he can shoot both events on the high level and this his first final is really big success.

XXXX, although still junior, he's our best air rifle men shooter. Performance in MIX event was not so good, but after, in individual concurrency he approved my statement. This is also his first final on big competition and great success.

XXXX was on his lower level of results this year. He started very well and was in the top three first half of match then he made tactical mistake that he didn't take a break after few worsted shots and couldn't comeback up after that. But this competition and WCH are very good preparation for his biggest challenge this year – Youth Olympic Games.

XXXX was under her capabilities. She shot very high results in trainings last month and I really expected they will be easy in final in MIX event and fight for medal. Something is happen with her, I don't know what, but she didn't shoot any good result on big competitions last and this year. I hope she will get over it and show her real performance in Korea.

XXXX totally disappointed. I knew he was not in full training but his performance during World Cups and camps earlier this year showed that he can reach final in this concurrency and fight for medal. Yet he didn't have enough power for full match.

This competition is a big experience for all of them and I hope they will improve their results in Korea, because there is much bigger concurrency and a level of results must be higher for good ranking.

Head coach of rifle team

SELF - EVALUATING QUESTIONS:

What information the shooting diary should contain?

What is the difference between a shooter's and coach's shooting diary?

11. USE OF OPTOELECTRONIC EQUIPMENT

Special optoelectronic devices have been put in use recently for better diagnostics of the problems that appear during shooting. Because of the small size and mobility, the shooter can train anywhere (shooting range, in his room,...), which saves time, ammunition, money.

The optoelectronic devices measures and records the shooting process accurately and objectively. The shooter receives immediate feedback on the shot, making training very efficient. It is a fact that the sooner you can rid yourself of bad shooting habits, the better shooter you will eventually be.

In 1982, the Finnish company Noptel began its production of optoelectronic devices intended for the development of shooting sports. The first quality product, which we know in today's format, was Noptel ST 1000, which appeared at the end of 1988/9 and represented the father of the art. The response of a group of Russian enthusiasts in the form of the Scatt device, a company that started operating in 1991, soon arrived. With the advancement of technology today, other companies are also involved in the production and development of optoelectronic devices.

The most popular and sophisticated optoelectronic device is the Scatt shooting training system, so it will be used to describe the characteristics and capabilities of optoelectronic devices.

One of the best descriptions of the usefulness of these devices for shooters was given by Snjezana Pejic (CRO), one of the best shooters of today:

“I like the concept of Scatt shooting trainers because they are not specifically designed for high-level shooters or just for beginners. Anyone can use them, and they will help everybody. When you are just starting or you are a middle-level shooter it will open endless possibilities and show you things that you wouldn’t think of noticing. And with the high level shooters, it will help to improve the smallest details that could get you the one extra point that matters.

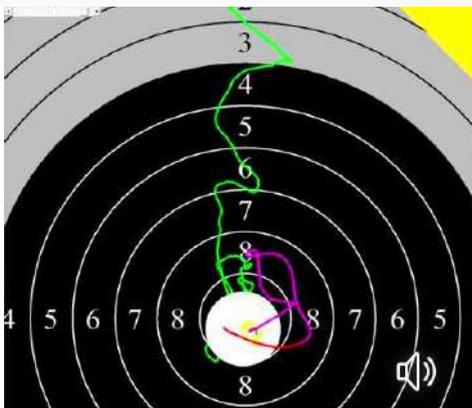
I’m using the Scatt for more than 10 years and, frankly speaking, I can’t imagine preparing for the competition without it. I use it at least a couple times a week and especially if I’m having some problem that I’m not sure what it is. Usually, it takes me one training session to pinpoint the problem and then I keep using Scatt until I resolve the issue.”

By using the optoelectronic devices, the shooter and the coach can control and correct all the three most important factors of the shooter's performance – posture, aiming and triggering control.

These devices provide statistical data and graphics such as: distance from the center in x and y axis, coordination between aiming and triggering, rhythm of shooting, score forecasting depending on the moment of firing and projections for ammunition spread.

Let us start by showing the trace of movement of the rifle on the screen.

For easy following the process of the shot delivery, the trace is marked in different colors and is limited by time intervals:



Green line - display time can be set by the user

Yellow line – 1.0 - 0.2 seconds before firing

Blue line – 0.2 – 0.0 seconds

Red line – movement after firing

Individual description of each part of the trace:

Green trace – represents the way of approaching the center of the target. It shows the time and direction of the approach. By selecting the ``All Traces`` button from the menu, the shooter can see all the traces from a series of ten shots. The consistency of the approach shows whether the shooter always brings the rifle to the center of the target in the same way and from the same direction.



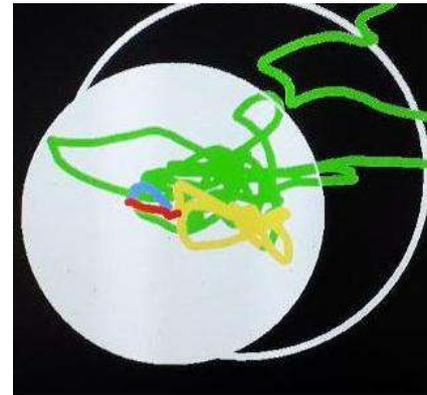
Yellow trace – represents the final second before the shot is fired. This part of the trace shows a few things:



- Position of hold - is related with the aiming
- Speed of movement in mm/s – the ``length`` of the trace in millimeters is indicated in the lower-left corner
- Size of aiming area – is related with stability and steadiness
- Shape of aiming area – is it round, more horizontal or vertical

The shot is good when the trace is as short as possible, moves slowly, is in the center of the target and round shaped.

Blue trace – the last 0.2 seconds before the shot is fired. It shows what happens during the trigger release. The short trace, almost like a dot, means that the triggering is smooth and clear. In addition to the smooth and clear triggering, the length and direction of the blue line indicate whether the position of the finger on the trigger is good. If the blue line is directed to the left, it means that the trigger is far away and vice versa.



Red trace – the recoil of the rifle. It lasts about a tenth of a second and usually is straight up. Its height varies depending of the rifle we use – air rifle or small bore rifle, weight and balance of the rifle and the stability of the shooter’s position. After recoil, the rifle will fall back down. If the movement is natural without any other force, and ends near its start point, the red trace will also show good follow through.

On the left side of the screen, a table with numerical indicators of the shot processing is displayed. The most common indicators are: shot index, shot orientation relative to center, shot score, Time - aiming time, 10.0 – ratio of hold inside 10.0 ring, 10a0 – ratio of hold inside 10.0 ring diameter centered on average aiming point, mm/s – aiming trace speed (the length in the last second before firing), mm/s/250ms - trace speed (the length in the last 250 ms before firing) and DA – distance between average aiming point and breach.

Match, 60 shot(s)

#	Result	Time	10.0	10.5	10a0	10a5	mm/s	mm/s/250ms
1	10.8	10.4	100%	67%	100%	97%	10.6	10.6
2	10.5	11.3	100%	90%	100%	94%	11.0	9.6
3	10.1	13.5	99%	34%	100%	100%	11.9	13.4
4	10.5	10.5	100%	68%	100%	87%	10.0	7.1
5	10.4	8.5	100%	88%	100%	91%	12.9	13.3
6	10.8	12.1	100%	89%	100%	97%	10.5	10.6
7	10.9	10.9	100%	83%	100%	97%	9.9	8.9
8	10.5	7.7	100%	98%	100%	95%	10.4	9.8
9	10.7	12.6	100%	80%	100%	92%	11.4	11.9
10	10.5	13.0	91%	44%	100%	93%	12.2	11.0
100	105.7	11.1	99%	74%	100%	94%	11.1	10.6

More demanding shooters on the list can also include a ratio of hold inside 10.5 and 10a5.

Explanation of individual indicators:

Time should be as constant as possible within a maximum of 2-3 seconds;

10.0 and 10a0 show the steadiness of the rifle. The higher the ratio is, the better the stability.

When the percentage at 10.0 is significantly lower than 10a0 it means that the shooter has made an aiming error or he did not adjust the rear sight properly.

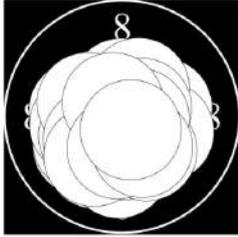
Mm/s shows the steadiness of the rifle during the final aiming procedure. It should be lower than 15 mm/s if you want to achieve high results.

Mm/s/250ms shows the final impulse of triggering. Smooth and clear triggering gives a lower value.

DA represents the coordination between the aiming and triggering. Lower value shows better coordination.

At the end of a series of 10 bullets and at the end of the whole session, the average value for all shots was calculated.

Statistical data and graphics will allow the shooter and the coach to get a complete analysis of the performance of the shooting technique. Based on that, it is much easier to correct mistakes and make plans for the next trainings.



Number of match shots	60
Result	integer 600 fractional 628.7 average 10.5
Result for the shot group in relation to the center of the target	629.7 (+1.0)
Total shooting time	01:01:29
Average time per shot	00:01:01 (00:00:37, 00:05:34)
Stability of time interval between shots	61%
Diametrical dispersion (group size)	3.9 mm
Stability of aiming	3.9 mm
Accuracy of shooting	0.5 mm
Average steadiness in 10.0	96%
Average length of a tracing	12.2 mm horizontal 8.5 mm vertical 6.9 mm
Elliptical factor	for group 1.05 for tracings 1.25
Control interval	1.0 sec

General info related to whole session

All the most important elements of training are listed and are used to assess the success of this training. By comparing this data with the data in the following trainings, the progress in improving shooting skills is monitored.

Distance

This graph shows whether the balance of the position I of the shooter-rifle system is good. It can be seen that the movement of the rifle in the horizontal plane is slightly larger than the vertical, which is natural for a standing position. If the lines are relatively straight and parallel it means that the balance is well set.



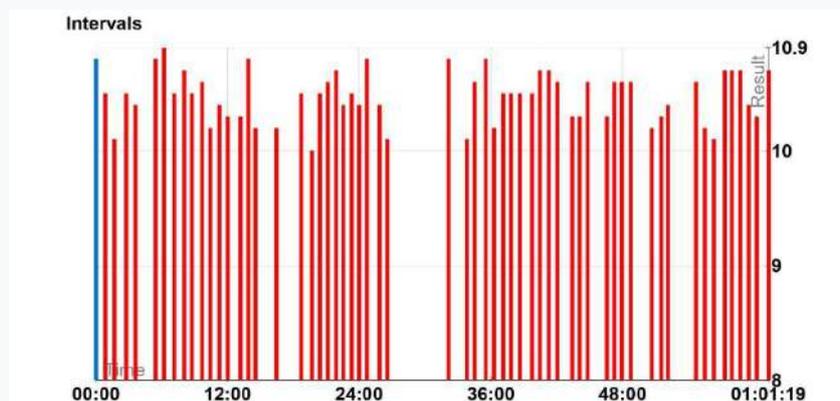
Coordination

The coordination between aiming and triggering is presented here. The smoother the curve, the coordination is better. This is especially true for the segment that shows coordination in the last second before firing.



Shooting rhythm

The graph shows whether the shooter leads the match well, that is, whether he respects tactical tasks. It refers to agreed breaks and breaks due to a drop in concentration or a weaker shot.



Shift

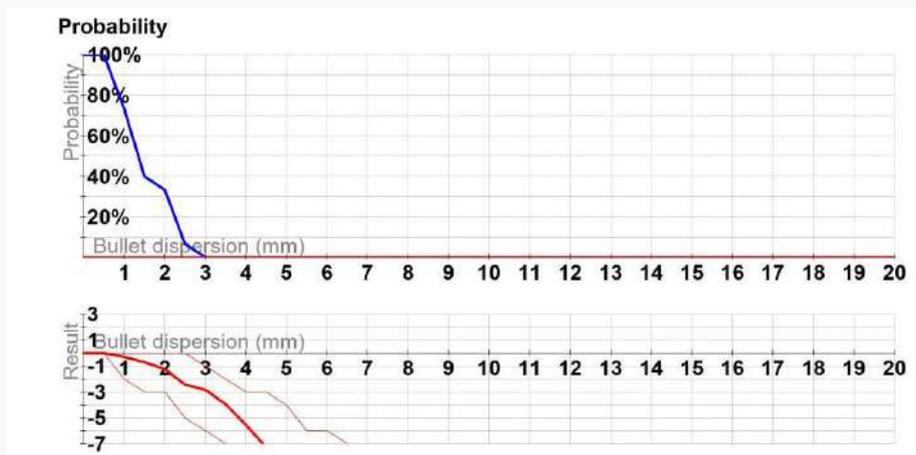
Score forecasting depending on the moment of firing. It can be seen that the shooter could have fired earlier and achieved the same result. This is related to the stability of the rifle, but the triggering process was not yet prepared. Usually, the projection of the highest result is 0.2

seconds before firing, because it is "dead time" from the registration of a good target image in the brain, to the pulling of the trigger.



Probability

Projections for ammunition spread. This chart shows the need for quality and tested ammunition. Specifically, the projection for the result with the air rifle is shown. The result is the same if the ammunition spread is up to 1 mm. This means that if the zero spread is 4.5 mm, it can go up to 5.5 mm. Mostly it is also the diameter of the group of shots that is required when testing the pellets.



Conclusion: Optoelectronic equipment is not a luxury, but a daily necessity for any serious shooter and coach.

12. WEAPON AND AMMO TESTING

Testing of the weapon and ammunition is very important for achieving high scores. The quality of the weapons and equipment is at the highest level so that with world class shooters, the difference in the quality of the ammunition can be decisive for the rankings at the competitions. When a shooter knows that he has the best quality weapons and ammunition, it gives him confidence and motivation because he is then conscious of the fact that the score depends entirely on his fitness.



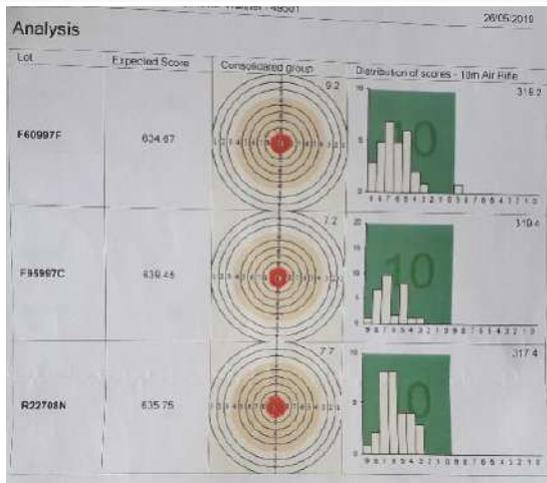
Testing of the weapons and ammunition is done from the bench. It is a tool, which consists of the metal plate fixed on the concrete block and the weapon holder. The weapon is placed in the holder and fixed by the stock, never directly to the barrel, so that the barrel can freely work.



When testing the pellets, the use of a speed-meter is recommended.

Testing of the air rifle and pellets

Testing is performed with 10 pellets in a group. The group of pellets must not be larger than 6 mm in diameter and should be circular. The



speed of the pellets has to be constant - not to vary more than 2m/s. There are different weights and caliber of the pellets. The caliber of the pellets should be chosen according to the barrel so that slight tension is felt while putting into the barrel. According to the pellet speed to which

the shooter is used to - usually about 175m/s, the weight of the pellet should be chosen. If it is possible, the shooter should use the same series of pellets throughout the season. Any change in the speed of the pellets or the movement of the weights on the barrel leads to a change in the group of shots. It is recommended that pellet testing be done after each change in speed or rifle balance.

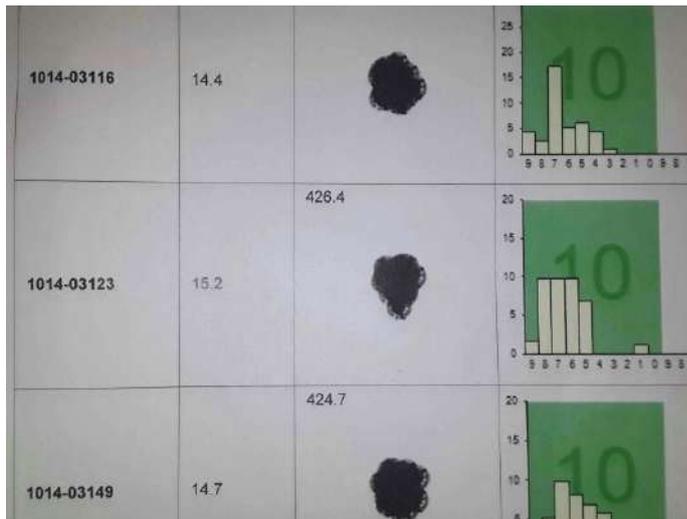
As a final check, the shooter should look for any damages on the pellet head before inserting the pellet into the barrel. If there are any, the pellet must be replaced.



When testing with various series of pellets, if a group of 6 mm in diameter cannot be achieved, the rifle should be checked. If everything is properly tightened and in order, then the barrel should be replaced.

Testing of the small bore rifle and ammunition

The barrel of the rifle must be cleaned before testing. Testing is performed with 30-40 bullets in a group. The groups have to be circular and up to 16mm in diameter. If the ammunition has a smaller group, but one or more incidents out of the group, it should not be taken into



account. It is better to choose the ammunition with a larger group, but without any incidents out of the group.

Also, the shooter should test the rifle and ammunition from a prone position as it is the most stable. Sometimes the second or third series, by the size of the group, shows better results "from the shoulder". When changing the speed of the bullet, there is different recoil of the rifle and thus a greater deviation from the center. When the ammunition is tested from the bench, these changes are not present because the system of the rifle is fixed.

If a good group cannot be achieved by many different series, the function of the rifle should be checked and eventually the barrel replaced. Before the competition the shooter should check if there are any damages on the bullet or extra oil, and not use such bullets. The ammunition should be kept in dry and dark rooms, with temperatures of about 18 degrees of Celsius. Special attention should be paid to the powder maturity. The ammunition which is good this season does not have to be good the next as well. The ammunition should be tested before the beginning of each season.

SELF - EVALUATING QUESTIONS:

Which are the basic conditions for proper ammunition testing?

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