

EFFECTS OF THE WEATHER

A. GENERAL.

1. Once a shooter has developed good positions and proper shooting techniques, effects of the weather are the primary cause of error in the strike of the bullet. The wind, mirage, light, rain and humidity all have some effect on the bullet, the shooter, or both.

2. In most international matches, each shooter is protected from the elements by an enclosed booth. In this situation, the shooter must primarily be concerned with the effects of the weather on the bullet itself.

3. However, since 1966, shooting booths are no longer required by the ISU. The only protection afforded a shooter in most instances, is a roof to shield him from the direct rays of the sun and rain. This leaves the shooter vulnerable to the wind, which is his greatest problem.

B. POSITION CHANGES.

1. A shooter firing without the protection of a booth will find that the effect of the wind blowing on him and his rifle must become his primary concern. The effect wind has on the bullet in flight is minor compared to its effect on the shooter's ability to hold on the aiming point.

2. When modifying positions for the wind, the shooter must remember not to violate the basic fundamentals of assuming the three positions. The muscles will be more tense than normal and must be consciously used to return the hold of the rifle back on the bull's-eye during lulls. The positions must be built to take advantage of bone and ligament support. A more aggressive and quicker trigger control may be used but the trigger is definitely not jerked.

3. The prone position is essentially unaffected except in an unusually strong wind. If this occurs the shooter may do one of two things depending on the type of prone position he has. Those shooters having a "loose" position will usually shorten the sling slightly to make the position tighter. Those shooters already having a tight position may lengthen the sling slightly, to lower the position, but not loosening it up. However in lowering the position, the shooter must take care not to change his position into one that is illegal.

4. There are two schools of thought as to what is the best method of firing the more unstable kneeling and standing positions in the wind.

a. Some shooters believe that regardless of the wind velocity, no changes should be made in their shooting positions. The technique is to remain in the aiming position and wait for a slight lull, reestablish the rifle hold on the bull's-eye and fire the shot. Other shooters feel that waiting for a lull is best in a moderate wind, but in a strong wind they deem it necessary to exercise greater control of the rifle muzzle.

b. Control of the rifle muzzle can be gained in the kneeling position by moving the fore-end stop out slightly, lengthening the sling, and leaning the torso forward towards the left knee. This forces more body weight into the rifle and left arm, hence dampening the rifle oscillations caused by wind.

c. In the standing position the palm rest may be moved forward slightly. The shooter must refrain from increasing the use of the left arm muscles to support the rifle. In order to maintain elevation and weight distribution, the shooter may spread his feet slightly more than normal. Often the grip of the right hand will be increased, and the shooter will use a more aggressive trigger control.

5. In international competition the positions must be shot in the sequence of prone, standing, and kneeling, but in many other matches the shooter is able to choose the order of firing each position.

a. If the shooter is in a booth and protected from the elements, it is most advantageous to fire the prone position during the period of the best conditions and shoot his standing position during the worst conditions. In the prone position the shooter is able to hold within the 10-ring and fire all 10's. Thus, any wind can only be detrimental and reduce the shooter's prone score. In the kneeling and standing positions even under ideal conditions, the shooter is unable to hold every shot within the 10-ring. He can attribute some of the poor shots to his lack of normal control. Also, under adverse conditions the shooter will not always be able to have the correct windage of his rifle. Thus, some of the shooter's 9's will be blown into the 10-ring and about the same number of 10's will be blown out of the 9-ring. As a result the shooter's score is not lowered appreciably by the worse conditions.

b. The reverse is true in those matches where the shooter is unprotected from the wind. The standing position should be fired under the best conditions and prone position in the worst. In this situation the shooter's prone score may be 5 to 10 points lower than normal. However, he may save as much as 20 to 30 points standing by not firing misses and other wide shots that are unavoidable when a strong wind is blowing on the shooter and his rifle.

C. SHOOTING IN THE WIND. There are generally three methods of shooting in varying wind conditions.

1. The first method is to "shoot fast and chase the last shot." This is the least favorable technique. This method is successful only while shooting prone when there is negligible wind or no wind. The changes in conditions that take place must occur slowly so that the shooter can actually fire two or more shots before a further change moves the impact of the shots to the 9-ring or worse. The shooter can thus see the shots impacting towards the 9-ring, indicating a change in occurring, and correct the sights for the next shot. The shooter may fire bad shots in haste and may lose several points if the conditions worsen before he realizes another method must be used.

2. A second method is to estimate the wind velocity change, correct the sights the prescribed amount and fire. An experienced shooter is capable of exceptional control in this method and may fire a fine score. Familiarity with the range and its peculiar conditions can be very important when shooting in this manner.

3. A third method is to select a single acceptable condition and shoot only when that condition exists. This is the slowest method, however, and the shooter must stay in position for long periods waiting for the repetition of the chosen condition.

4. The majority of experienced shooters will use a combination of estimating wind changes and shooting in a given type of condition. While shooting sighters, these shooters will select two or three conditions which occur frequently and note the differences between them. This allows them to change from one condition to another with a minimum amount of estimating wind changes, and is much faster than shooting in only one condition.

D. EFFECTS OF THE WIND.

1. A wind of constant velocity that changes direction will effect the bullet differently. To evaluate the wind, the shooter imagines himself in the center of a clock face and his target at 12 o'clock. Winds from 8-10 o'clock or 2-4 o'clock have the greatest effect on a bullet and are called "full value" winds. A wind of the same velocity as a full value wind, but blowing from 1, 5, 7 or 11 o'clock, will affect the bullet approximately half that of a full value wind. For this reason it is called a "half value" wind. A wind coming directly from 12 or 6 o'clock will require no windage correction and is referred to as a "no value" wind. However, a strong wind of this type may have a slight effect on the vertical displacement of the bullet.

2. Because of the clockwise spin of the bullet, the wind does not displace the bullet on a flat horizontal plane but in a diagonal direction from 10 to 4 o'clock. A wind coming from the right will cause the bullet to rise in addition to being shifted left. In a left wind the bullet drops as it is being blown to the right.

E. READING THE WIND. A great part of a shooter's success will depend upon how well he can recognize a given condition and the effect it will have upon the bullet. A proficient wind doper has experienced many long hours of practice. The first thing a shooter should do upon arriving at a range is to note the prevailing wind direction. In order for the shooter to have a sufficient span of a given uniform condition to fire a match, the wind condition the shooter chooses to fire under must occur quite frequently. Various wind indicators which the shooter may use include:

1. The direction of low clouds over the range and dust blowing on the range.
2. One of the best indicators for detecting wind changes are the wind flags properly placed between the shooter and his target. Many shooters use these flags exclusively for reading wind and are quite successful.
3. Mirage is used by many shooters as a check on movement of the wind.
4. Dust kicked up by the bullets hitting a dirt backstop are indicative of wind direction.
5. The muzzle smoke of the shooters on adjacent firing points can also be noticed easily and used advantageously.

F. EFFECTS OF LIGHT INTENSITY AND DIRECTION. Effects of the light are controversial. The intensity and direction of light affects different people in various ways. Therefore, only guide lines can be given as to what is correct for a shooter in a given light condition.

1. The well equipped shooter will have three sight filters or pairs of shooting glasses--clear, yellow, and grey or green. Generally, using the appropriate shade of glasses the shooter will be able to see equally clear on sunny or cloudy days. Most shooters prefer the yellow or clear glasses on dull or overcast days, and the grey or green glasses on sunny days. There is a widespread belief among shooters that on dark days, yellow glasses gather in more light and hence brighten up the target. **THIS IS NOT TRUE!** Shaded lenses of any color, including yellow, filter out some degree of available light. However, colored or shaded lenses may provide greater contrast thus producing a clearer and more distinct sight picture to the shooter.

2. The human eye can usually distinguish black against yellow easier than it can black against white. Thus, on a cloudy day when a shooter should not wear his grey or green sun glasses, he must determine which is best for him. Should he use yellow and have the more easily distinguished yellow-black sight picture and less total light entering his eye; or forego shaded lenses completely and have considerably more light entering his eye and use the slightly more difficult to distinguish white-black sight picture?

3. Under extreme conditions of near darkness or bright glare, changing glasses may not completely clear up the shooter's sight picture. Sometimes changing the rear sight aperture size will help. A slightly smaller size cuts down the total amount of light entering the eye on bright days, and a larger size will permit more light to reach the eye on dark days.

4. Shooters using a post front sight often will experience elevation changes on days of varying light intensity caused by intermittent cloudiness. When the sun is sighting, an apparent haze forms around the black bull's-eye causing the aim to be low. When the sun is shielded from the target, the haze is gone and the tendency is to hold closer to the black causing the shots to go higher. Sometimes, if the sun is extremely bright and shining directly on the face of the target, the black may tend to look smaller than it actually is. Because of the apparent reduction in aiming area, the shooter will unconsciously hold higher.

G. HUMIDITY AND RAIN.

1. To understand the effects of humidity, the shooter must realize that the higher the humidity, the denser the air. This heavier air presents more resistance to the flight of the bullet. The resulting change in velocity on a humid day will require an elevation sight change to hit the same location on the target as compared to a day when the humidity is lower.

2. Rain presents problems other than merely keeping equipment dry.

a. The rain has only slight effect on the trajectory of the bullet. A normal light shower will not affect the bullet, but during a heavy rain or downpour the shooter will find the sight elevation must be raised one or two clicks.

b. During a rain, the wind flags become wet and heavy and thus useless for detecting minor wind velocity changes. In a light rain small wind variations can be easily seen by watching the angle of the rain as it is falling. In a heavy rain, a large wind change may occur before the angle of the falling rain will be changed. The wise shooter in this situation will usually hold up firing if possible until he can once again detect the minor wind velocity changes.

c. Immediately following a rain, if a hot sun appears, the ground water will begin to evaporate, producing an extremely heavy mirage of high density air. Since the wind flags will remain wet for some time, the shooter must be cautious in determining the value of any wind changes.

H. MIRAGE. The word "mirage" refers to the heat waves or the reflection of light through layers of air of different temperature and density as seen by the naked eye on a warm bright day. With the telescope some mirage can be seen on all but the coldest days.

1. As observed through the telescope, the mirage will appear to move with the same velocity as the wind, except when blowing straight into or away from the scope. The mirage then will give the appearance of moving straight up with no lateral movement. This is termed a "boiling" mirage.

2. An important effect of mirage is the light diffraction caused by the uneven air densities characteristic of heat waves. Depending on atmospheric conditions, this diffraction will cause a displacement of the target image in the direction of the movement of the mirage. Thus, if a mirage is moving from left to right, the target will appear to be slightly to the right of its actual location. Since the shooter can only aim at the image received by his eye, he will actually aim at a point which is offset slightly from the center of the target. This error will be in addition to the displacement of the bullet caused by the wind.

3. An additional effect of mirage can be detected on an intermittent cloudy day. The shooter will note that when a cloud obscures the sun the mirage will start to dissipate. Although the wind velocity has remained constant as shown by the wind flags, his shots will no longer be centered but displaced in the direction from which the mirage was coming.

4. Proper reading of the mirage will enable a shooter to estimate and make windage corrections with a high degree of accuracy. However, at 50 meters, few shooters use mirage as the sole means of determining the effective wind. Unless it is a very hot day and the sun is shining brightly, at this short distance it is usually quite difficult to see enough mirage to accurately determine its minor velocity changes. Watch the wind flags!

5. In the prone position, where the shooter is able to hold within the 10-ring indefinitely, the mirage is sometimes used as a double check with the wind flags for highly accurate wind reading. In the kneeling and standing position the shooter cannot hold within the 10-ring for extended periods. It is detrimental to performance to spend time while in the aiming position studying mirage when wind variations are quite easily detected by the many small wind flags. Usually in these positions, mirage is checked only for its direction if there is not enough wind to disturb the wind flags and the mirage is alternately drifting from left and right.

6. The best way to learn to read mirage is to practice in varying wind conditions on days when mirage is easily visible. In general, the shallower the waves of the mirage the faster the velocity and resultant wind speed. Changes in wind velocity can be determined by observation of the mirage up to speeds of approximately 12 mph. Beyond this speed the movement of the mirage is too fast for detection of minor variations.

7. Mirage is located by focusing the spotting scope several yards short of the target. The target will appear slight fuzzy but not so far out of focus that the shot value cannot be determined by looking at the black portion of the target.

I. SHADING. A discussion of wind and weather conditions would not be complete unless the technique of shading or holding over were discussed. Shading is a technique of allowing for wind change by deliberately holding over or aligning the front sight toward the direction of the wind in order to compensate for the change without making a sight adjustment. Sometimes this technique can be beneficial to the very experienced shooter during a constantly changing condition and or when it is necessary to shoot a large number of shots in a relatively short period of time. This could also occur when a shooter does not have time to wait for a particular condition or can not return to the sighting target frequently. Shading may also be beneficial when the shooter senses a slight wind change and then is careful not to break the shot on the windward side of the target. In a sense he is shading or is being careful to break the shot into the wind so that any pickup or drop off in wind velocity will cause the bullet to drift into the ten-ring. Shading is not recommended because even the most experienced shooter will have difficulty judging how far to shade or hold off. Shading also increases the possibility of elevation error due to the fact that the bull's-eye is off center in the front aperture.