

National 4-H Shooting Sports Quiz Bowl Muzzle loading Study Resources

These resources are for enrolled 4-H shooting sports members and coaches for their expressed use as study materials in preparation for the National 4-H Shooting Sports Quiz Bowl. They are not to be used to train a person or persons in the use, discharge, or handling of any firearms and archery equipment.

Lesson 1 Narrative

Black Powder and Muzzleloading Arms

Muzzleloading firearms safely use only black powder or Black powder substitutes. Both of these propellants burn very quickly at explosive rates. As a result, they demand special care on the part of the shooter.

Muzzleloading firearms are available in rifles, pistols, shotguns and muskets. All of them share some common parts: lock, stock and barrel. In the last session we looked at muzzleloaders and their history. The predominant types available today are flintlock and percussion or caplock arms. Matchlock and wheel lock guns are primarily of historical interest.

Basic Firearms Safety and Muzzleloaders

All the basic firearms safety rules apply to handling muzzleloading arms. The shooter must exercise personal responsibility for use of any firearm, since the only real safety device on firearms is the user.

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The first cardinal rule on firearms safety requires that the shooter have self-control. Another cardinal rule is to control the muzzle at all times. The shooter is responsible for keeping the muzzle pointed in a safe direction. That direction is governed by common sense and the conditions at the time. In most instances the muzzle may be safely pointed down range or straight up. It must never be pointed toward another person. The muzzle never should be pointed at anything you do not intend to shoot. In a field situation that demands absolute and complete target identification. In all cases it demands that a safe zone of fire be clearly identified. It also demands that the shooter know where the projectile will stop, that an adequate backstop be identified and that entire field of fire to backstop be clear and safe.

The last checkpoint for a shooter before the projectile is fired is the trigger. The finger should stay off the trigger until the shooter is in the act of firing a shot. Keeping the finger along the side of the trigger guard helps to prevent accidental discharges.

The firearm should not be loaded until it is ready to be fired. In muzzleloading arms, the shooter may wait until just before the shot to cap or prime the gun. A gun with a cap on its nipple or a closed flash pan should be considered loaded and ready to fire. Every muzzleloader should be treated with the respect due a loaded firearm until it is personally determined empty. The condition of the muzzleloader can be checked by using a ramrod after the ignition system is rendered safe by removing the cap or lifting the frizzen and removing all priming powder. Insert the ramrod into the bore, marking the point where it emerges from the muzzle. Then hold the ramrod beside the barrel with the mark even with muzzle. If the end of the ramrod reaches the nipple or the flash hole, the barrel is empty. If it does not, the gun should be considered loaded. Many shooters mark the ramrod twice - once for an empty gun and a second time for a specific, preferred load.

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Personal protective gear is vitally important to muzzleloader shooters. Muzzleloading arms vent a portion of their gases through the nipple or flash hole. In addition, chips of flint, steel filings or bits of the percussion cap may be ejected during firing. The eyes are exposed to all these potential dangers. Eye protection is absolutely essential to all persons on the firing line with muzzleloaders. In addition, flintlock shooters should be given a wide safety zone on the lock side to avoid the gases and smoke from the flash hole. Ear protection is as important to muzzleloader shooters as it is to shooters using fixed ammunition.

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Loading should NEVER take place from a stock container.

Smoking should never be permitted around gun powder, especially with black powder. Powder containers should be located so shooters will not be firing over them. A spark from a muzzle is just as dangerous.

Shooters should also be careful to use only non-sparking tools and equipment around black powder.

A shooter should NEVER attempt to clear any obstruction, including a lodged ball, by firing.

More Safety Considerations for Muzzleloaders

A number of additional safety concerns are associated with loading a muzzleloader. Powder and percussion caps must be properly stored and handled carefully. Since the shooter is loading from the muzzle, care is essential. The shooter should minimize the exposure of their hands, face and body during the loading process. The muzzle must be pointed away from the body. The ramrod must be handled with the minimum exposure of the hands necessary. Finally, the shooter should NEVER blow down the barrel to make sure the barrel is clear. This is extremely hazardous and places a vital part of the body directly over the muzzle. NEVER point a gun at something you do not intend to shoot.

Since black powder burns explosively, the amount of powder exposed should be minimized. A powder measure separate from the flask or horn should be used to transfer powder from the stock container to the firearm. Loading should NEVER take place from a stock container. It is equivalent to holding a bomb. To reduce the potential for an accident, seal or cover the stock container before pouring the powder into the barrel.

Sources of sparks should also be minimized. Smoking should never be permitted around gunpowder, especially with black powder. Powder containers should be located so shooters will not be firing over them. A spark from a muzzle is just as dangerous. Shooters should also be careful to use only non-sparking tools and equipment around black powder. Tools may be made of brass, copper, horn, wood or similar materials. Finally the shooter should make sure there are no lingering sparks in the barrel from the previous shot. Swabbing the barrel between shots with a moistened patch reduces fouling, eases loading and snuffs out any sparks that remain.

The projectile must be firmly seated on the powder. If not, it forms a barrel obstruction and poses a danger to the shooter and bystanders. Seating problems may be avoided by frequent cleanings. A clean barrel loads more easily than a fouled one and reduces the potential for a stuck load. A shooter should NEVER attempt to clear any obstruction, including a lodged ball, by firing. Either seat the bullet completely or remove the stuck projectile properly. Marking the ramrod provides a ready check on seating. Bullets should be seated firmly, but they should not be pounded into place.

Safeties and Making Muzzleloaders Safe

Muzzleloaders do not have safeties in the same sense as breech-loading arms. Most muzzleloading arms have a half-cock feature that holds the hammer or cock off the nipple or frizzen. Most muzzleloaders can have the hammer fall front that position under severe enough circumstances, like dropping the firearm from a tree. The device is merely an aid to otherwise sound firearms handling.

Unlike breech-loading firearms, muzzleloaders cannot be easily opened and cleared. The easiest and preferred way of emptying a muzzleloader is to fire it in a safe place. In competitive events, the range officer will give the command to "dump it in the hill." Shooters fire their loads into the backstop without aiming at targets.

If shooting is not possible or the arm will not fire, a more involved process is necessary. Using a CO₂ discharger is a preferred and safer method. If a CO₂ discharger is not an option then the powder charge must be deactivated, and the bullet must be pulled. To deactivate the powder charge, remove the nipple from the breech and remove the barrel from the stock. Soak the breech end of the barrel in a bucket of water for at least one hour. Using a work rod and a ball, screw the ball puller into the ball or bullet and pull the ball. Then thoroughly scrub the bore to remove all powder residues, just as you would when cleaning the muzzleloader.

Field shooters may need to make their muzzleloaders safe temporarily in many types of situations. In percussion guns that can be accomplished by removing the percussion cap from the nipple carefully. Avoid using sharp objects or those that might strike sparks. Once the cap has been removed, place a small scrap of leather over the nipple and gently lower the hammer onto the leather. Do not dry fire a percussion gun! The impact of the hammer on the nipple will damage the nipple severely.

Flintlocks can also be made safe temporarily. Lift the frizzen, exposing the priming powder in the flash pan. Remove all the powder carefully by blowing or wiping it away. Cover the frizzen with a leather sleeve or glove to protect the steel surface. Insert a pipe cleaner into the flash hole, and lower the cock to the fired position with the frizzen still raised. Remember, an unprimed or uncapped muzzleloader is still loaded and could fire under the right conditions! Keep them pointed in a safe direction.

Handling Black Powder Safely

Black powder must be stored properly for safety purposes. Use the original containers for storage. That avoids all confusion because the powder is stored in labeled and properly identified containers. It increases safety because the containers are designed for storing powder. Glass or plastic should not be used. Glass may break, the solvents in the plastic may react with the powder and both materials may build up static electricity.

Powder should be stored in a cool, dry place. It is heat sensitive and hygroscopic, meaning that it draws moisture from the air. Wet powder can become deactivated, causing all sorts of difficulties for the shooter. The storage area should also be free of solvents and oil, which can react with the powder and deactivate it.

The storage area should be free from flame and sparks. It should not contain percussion caps, primers or other types of powder. It should not have motors present, since they produce sparks during operation.

Since black powder is hygroscopic and explosive, only the amount needed for a day afield or' on the range should be carried at any given time.

Since black powder is hygroscopic and explosive, only the amount needed for a day afield or on the range should be carried at any given time. It can be carried safely in sealed, waterproof containers made of non-sparking materials. Powder horns are traditional devices for carrying powder, but powder pouches of leather or flasks made of brass or copper also are in common use. Some shooters prefer to carry pre-measured powder charges in small vials or specimen tubes.

Powder should always be measured carefully. Shooters may use a hollow piece of antler or horn, an empty cartridge case or an adjustable measure to dispense powder. Measures attached to powder containers should not be used. Powder should never be poured directly from the container into the barrel. The shooter should work up appropriate loads, following the manufacturer's recommendations. Be sure to use the proper granulation. Each step should be double-checked to be sure proper procedures have been followed. Shooters should develop a safe, habitual loading routine with complete attention to detail, caution and care. The muzzle should be pointed in a safe direction throughout the loading process.

Developing a Safe Loading Procedure

One of the keys to safe loading is the attitude of the shooter. Loading the muzzleloader should be taken seriously because mistakes can be dangerous or even fatal. The shooter must be alert and attentive, giving the procedure undivided attention.

The first step in loading a muzzleloader is to verify its condition, making sure it is empty. The hammer should be raised to the half-cock position with the flash pan empty or the nipple without a cap. Then the barrel should be checked with the ramrod to see if it is empty. The shooter may measure the ramrod against the barrel or use a mark ramrod. The barrel should be clean, and new barrels should be carefully cleaned before they are fired for the first time.

The next step is to swab the barrel with a patch moistened with alcohol or black powder solvent. This patch eliminates oil, moisture and powder residues. It also snuffs out any lingering sparks from a previous shot. This swabbing process also eases the passage of the next ball or bullet by cleaning the bore.

Wise shooters now clear the nipple or flash hole by firing once down range. Caplock firearms may be cleared by firing several caps. The muzzle must be pointed in a safe direction, away from people and powder. It should be held close to a light object, such as a leaf or blade of grass, to detect the passage of gas from the barrel. Movement of the object indicates that the barrel is clear and the nipple is clear. If debris from the caps fills the nipple, it must be removed with a nipple pick. Flintlock shooters must clean the frizzen, pan and flint with alcohol and dry thoroughly. The flash hole can be cleared with a pipe cleaner or pick.

Next, the powder charge is measured carefully. The horn or flask is sealed before the powder is poured into the muzzle. Keeping the face, hands and body clear of the muzzle the shooter dumps the powder into the muzzle. Striking the side of the barrel with the flat of the hand settles the powder. The shooter must be careful not to double charge or excessively charge the gun with powder, making sure the charge is within the manufacturer's recommended listings.

If a patched ball is being used, the shooter centers a cotton or linen patch of the proper size and thickness over the muzzle. The patch forms the seal between the bore and the ball, so it must match the bore and the ball diameter closely. Avoid synthetic patches or plastic sabots. The rifle manufacturer's warranty may be voided because these materials can leave fouling that is very difficult to remove.

The patch should be lubricated. Several types of lubricants may be used effectively. Bullet lube, special patch lubes, vegetable shortening or even saliva can be used to lubricate the patch. The "spit patch" is handy all the time, but it often gives more erratic performance. In hunting situations the spit patch can dry out, losing its lubricating and sealing capacity.

The next step is to start the ball into the bore. The ball is centered in the bore with the sprue (the flat part where the mold cuts the lead off) facing up. The short starter is then used to push the bullet into the muzzle slightly. At that point, excess patching material may be cut off with a patch knife. Then the ball is pushed a short distance down the bore with the long starter. Finally, it is seated completely on the powder with the ramrod.

The ramrod should be grasped only about 15 to 20 centimeters (6 to 8 inches) above the bore. That prevents breaking the ramrod and risking injury from broken parts of the ramrod. Push the ball down the bore with a series of short strokes, seating it firmly on the powder. Do not pound on the ball. That deforms it and risks poor down-range performance. Check the bullet seating depth with the marked ramrod and be sure to leave no air spaces! Any gap makes the bullet behave as a bore obstruction with potentially hazardous results.

Bullets do not require a patch. The lubricated bullet is pressed into the muzzle and pushed down onto the powder with the ramrod. The same precautions apply to bullets and patched balls.

Once the bullet or ball is seated, replace the ramrod in thimbles. In a flintlock, prime the pan with a small amount of FFFFg powder. (Fill pan about $\frac{1}{3}$ full). More is not better, and the flash hole should not be covered with powder. Covering the flash hole slows ignition and makes it less dependable. Close the frizzen, and the flinter is ready to cock and fire. Percussion firearms need a cap seated on the nipple to prepare them for firing.

Firing the First Shot

Now let's move the first relay of shooters to the firing line. We will load the muzzleloaders and fire one shot on command. If you need help, the range assistant at your station will help you with loading. Check to make sure your rifle is safe. Now swab the bore with a patch soaked in alcohol. Clear the nipple by firing several caps or clear the flash hole and clean the frizzen and flint with alcohol. Carefully measure a powder charge and close the container. Dump the powder down the barrel, keeping the muzzle clear of your face, hands and body. Strike the side of the breech a couple of times to settle the powder. Place a lubricated patch over the muzzle (keeping it away from your body and slightly down range). Center a ball in the muzzle with the sprue pointing upward. Use the short stem on the starter to start the bullet into the bore. Press it further down the bore with the longer extension on the starter. Properly using the ramrod, push the ball down onto the powder firmly. Check the seating depth with the marks on the ramrod. Now move from the loading area to the firing line. Cap the nipple or prime the pan and fire when command is given. When command is given, then move ahead of loading bench to the firing line.

Summary

In this session we concentrated on using black powder and muzzleloading arms safely. We considered safe procedures of handling and storing black powder. We discussed the fundamentals of safe muzzleloading and safe firearms handling and noted the special considerations needed when a firearm is loaded from the muzzle. We developed a procedure for safely loading a muzzle loader and stressed that muzzleloading takes complete concentration. Finally, we loaded and fired a muzzleloader. Next time we will do more live firing with a rifle and learn how to clean muzzleloading firearms.

Summary Activities

1. Have shooters outline proper storage procedure for black powder.
2. Have shooters outline and discuss shooting safety with specific reference to muzzleloaders.
3. Have shooters develop a safe loading routine and discuss the reasons for using each step.
4. After having every shooter fire the muzzleloaders, ask them to describe the process and discuss their feelings about them.

Exhibit and Sharing Ideas

1. Develop a checklist or poster series on safe handling and storage of percussion caps and black powder.
2. Demonstrate proper handling of muzzleloading firearms and discuss the importance of each element in the process.
3. Demonstrate proper loading sequence for muzzle loading rifles.
4. Share what you have learned with an interested adult.
5. Write what you learned in your shooting journal. Exhibit the journal in an appropriate event or activity.
6. Experiment with different loads in a muzzleloader. Report your findings in an appropriate setting.

Lesson 2 Narrative

Muzzleloading Safety

Black powder is a low-yield explosive. It must be stored and handled carefully to avoid hazards to the shooter and bystanders. Like other types of firearms, muzzleloaders must be handled in accordance with the cardinal rules of firearms safety: shooters must exercise self-control and personal responsibility at all times. They must keep the muzzle pointed in a safe direction. Their fingers must stay off the trigger until ready to shoot, and they must load, cap or prime only when about to shoot.

Muzzleloading firearms share with other types of firearms the need for clear target identification, an adequate backstop, clear zones of fire and other features of down-range safety. The unique character of muzzleloading arms adds some additional safety considerations. Like other arms, they must be checked to verify their condition. Unlike breech-loading arms, muzzleloaders must be checked from the muzzle. They must have the cap or priming powder removed before checking them. The bore can be checked with a marked ramrod or by comparing the length of the ramrod inside the bore with its position outside the barrel.

Loading and firing requires a safe procedure with safe loads. Powder container must be closed after filling powder measure during loading. The possibility of an injury to the shooter exists should an accidental discharge occur.

Shooting Muzzleloading Rifles

Shooting procedures and range management for muzzleloading rifles differ in a few ways from cartridge arms. The shooting stations are farther apart, particularly when flintlocks are being used. Some of the gases vented during firing are ejected to the lock side of the firearm, posing a potential hazard to other shooters. Adequate space between shooting stations avoids problems from those gases or foreign materials carried by them.

Muzzleloaders also require more space for loading. A loading stand or table promotes safety, helping the shooter keep the muzzle pointed in a safe direction. If a loading area behind the firing line is used, the assistant at each firing point must reinforce proper muzzle control during the entire loading and firing process.

We will be using the same range management and shooting procedures used in pistol and rifle shooting with a couple of significant additions. [See *Fact Sheet 17: Pistol and Rifle Shooting Procedures* for more detail and include that orientation in this section.] The "load" command will be expanded when shooting by commands. Shooters will "swab the bore" with alcohol on that command, then clear *the* nipple or flash hole. The next command will be to "measure

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your powder charge." On that command shooters will measure the powder charge, seal the stock container and pour the powder into the barrel. "Seat a ball on the powder" directs the shooter to start a patched ball, seat it on the powder charge, check for proper seating depth and replace the ramrod in the thimbles.

A loading bench behind the firing line is mandatory. The shooter will then be instructed to "move to the firing line." They should hold the muzzle straight up while turning and stepping to the firing line. The command to "prime" or "cap your rifle" is the last loading step. It should be completed after the rifle has been pointed down range. The other major change from the standard range commands is that "make your rifle safe" may be preceded by "dump it in the hill," meaning that the shooter should fire any charge left in the rifle into the backstop but not at the target.

Once shooters have demonstrated their ability to follow proper loading and range procedures, a coach-pupil teaching technique will be used. A range assistant should be on the firing line at each station throughout the firing session to be sure that the shooters are following proper procedures.

Instructor's note: Instruction in position shooting, if it is conducted here, should follow the same format as the instruction in the rifle section of this manual.

Handling Misfires and Hang-fires

Muzzleloader shooters encounter ignition problems more frequently than shooters using cartridge arms. The way these situations are handled determines whether they are an inconvenience or a potential hazard. Misfires occur when the main charge fails to fire. They may or may not involve detonation of the cap or a "flash in the pan."

A hang-fire is a delayed ignition of the main charge. Sometimes hang-fires can be heard sizzling or hissing before the main charge fire. Sometimes they give no evidence of their presence until the firearm goes off. Extreme caution is essential when the rifle does not fire immediately.

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Regardless of whether or not the cap detonated or the priming powder flashed, the firearm should remain pointed down range for at least two minutes. During the wait, the shooter should be prepared for the arm to fire at any time.

Many causes of hang-fires or misfires can be identified. The nipple or flash hole may be obstructed. Even covering the flash hole with priming powder invites a slow ignition or hang-fire. The firearm may have been loaded improperly, for example loading without a powder charge. The powder, either the main charge or the priming powder, may have gotten wet, deactivating it. Water or oil may be filling the flash hole of nipple. The percussion cap may have gotten wet or oily, preventing it from detonating. The frizzen may be oily, wet or worn so the metal dents without producing a shower of sparks. Poor sparks can also be the result of a flint that is dirty, wet, oily or dull.

Several safety precautions must be taken with all misfire or hang-fire situations. Regardless of whether or not the cap detonated or the priming powder flashed, the firearm should remain pointed down

range for at least two minutes. During the wait, the shooter should be prepared for the arm to fire at any time. The muzzle must *always* be pointed in a safe direction and the firearm must be made safe by removing the cap or clearing the flash pan and padding the nipple or covering the frizzen. Even after these precautions, avoid unnecessary exposure to the muzzle. Follow a multi-step process with either a percussion arm or a flintlock. First return to the loading bench keeping the muzzle pointed in a safe direction. Lay the rifle on the bench with the muzzle ahead of the forward edge of the loading bench pointed down range.

With percussion guns, the first step is to inspect the cap and the nipple. Check the cap to be sure it had a priming compound inside and that it was struck by the hammer. Check the nipple to see if any part of the priming compound or other materials were obstructing the channel into the breech. If the cap fired, check the seating of the ball before proceeding. If the rifle is loaded, reseal the ball. Sometimes the pressure from the cap will move the ball slightly. Once that has been done, place a fresh cap on the nipple and attempt to fire once more. Use a CO² discharger if the muzzleloader still fails to fire repeat the sequence. Then try working a small amount of dry powder into the nipple with a pick or remove the nipple, pick out a small amount of powder place a tiny amount of fresh powder in the breech and replace the nipple. Complete the safety check then attempt to fire once more. Proceed if one is not available. DEACTIVATE the charge before going any further.

Deactivate the powder by removing the nipple, removing the barrel from the stock and soaking the breech end of the barrel in water for at least an hour. After the powder has been thoroughly soaked. Use a ball puller to extract the ball and wash all powder from the barrel. After the barrel has been cleaned and dried, the rifle may be reloaded carefully and fired.

Flintlock arms have several other potential causes for misfires. The flint and frizzen should be examined, cleaned and dried. The flash pan and flash hole also must be clean and dry. Prime the arm with fresh powder and attempt to fire it once more.

If it still fails to fire, repeat those steps, then work a small amount of fresh powder through the flash hole with a pick and attempt to fire once more. If a loaded firearm still fails to fire, deactivate the powder, pull the ball and clean the rifle. When the rifle is assembled again, fire with an empty rifle to see if an adequate spark is produced. If not, sharpen or adjust the flint. Once the rifle is sparking properly, load and fire.

Cleaning Muzzleloading Firearms

It is important to keep all firearms clean. With muzzleloading arms, the need is even greater. Cleaning clears the barrel of fouling, oils or preservatives. It eliminates potential obstructions to loading or firing safely. Cleaning also eliminates the corrosive residues from burned black powder. Black powder contains both sulfur and nitrogen compounds. The sulfur gives black powder

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Complete the safety check. Then attempt to fire once more. If the rifle fails to fire, DEACTIVATE the charge before going any further.

Dischargers are not always available. Get samples from each manufacturer.

smoke its distinctive odor. These compounds draw moisture from the air to form acids that can corrode or pit a rifle barrel in a short time. Some damage is only cosmetic. Serious damage can be unseen and it affects accuracy and safety of the firearm. Severely damaged arms are unsafe to shoot. Proper cleaning prolongs the life of the firearm. It helps preserve the accuracy and usefulness of the arm by keeping the bore in top condition and by maintaining the structural strength of the barrel and its attachments.

Muzzleloaders are partially disassembled for cleaning. Remove the barrel from the stock by pulling the barrel wedge and unhooking the barrel from the tang. Remove the nipple or the flash hole insert with a wedge pin tool, screwdriver or another appropriate tool. Immerse the breech end of the barrel in a bucket of soapy water (dish detergent also may be used). Place a cleaning patch on the cleaning jag attached to a work rod or the ramrod and swab the bore thoroughly. Pump the soapy solution through the bore until the water comes out clean. Scrub the nipple and the flash hole insert with a small brush to remove all fouling from the channels and the threads. Rinse thoroughly in clean, hot water and set aside to dry. Rinse the barrel, flushing the inside thoroughly with hot water. Run several dry patches through the barrel to dry the bore. If any fouling is evident, repeat the barrel cleaning process until the patches are clean. After the barrel is dry, swab it with a lightly oiled patch to prevent corrosion. Wipe the surface with a moisture protestant. Replace the nipple or flash role insert.

Remove the lock from the stock. Clean the lock thoroughly by scrubbing it with soapy water, rinsing it in hot, clean water and drying it completely. Lightly oil the moving parts and the surface of the metal to prevent corrosion. Avoid oiling the face of the frizzen or getting oil on the flint or the leather padding for the flint. Too much oil is worse than not enough, so use the gun oil sparingly. Clean any powder residues from the stock with a soft brush and cloth. Use water or oil on the stock only if a severe problem exists. Scratches may be treated with boiled linseed oil (thinned with turpentine or mineral spirits) or with a commercial stock finish. Do not soak the stock with gun oil. It tends to destroy the wood. After all these things are done, attach the lock and barrel to the stock.

Store the firearm in a secure, dry area with a stable temperature. Controlled access is essential to prevent unauthorized use. Storing the muzzleloader with the muzzle down allows any excess oil to drain out of the barrel. That can help prevent ignition problems and stock damage caused by oil seepage.

Summary

We reviewed the basics of black powder and muzzleloading safety. Muzzleloading shooting differs little from other forms of rifle shooting in range commands, procedures, safety precautions and shooting positions. We fired muzzleloaders and learned how to handle hang-fires and misfires. Finally, we learned proper cleaning and storage procedures for muzzleloading rifles. Next time we will explore the basics of shooting muzzleloading shotguns.

Summary Activities

1. Have every pair of shooters clean the rifle they used.
2. Have shooters practice acting as range officers and assistants without equipment.
3. Use the sequence of teaching steps found in the basic rifle shooting lessons to teach a series of lessons on position shooting with muzzleloaders.
4. Have a fun shoot with clay targets, balloons or similar objects.

Exhibit and Sharing Ideas

1. Record what you learned today in your shooting journal and exhibit that journal in an appropriate event or activity.
2. Study the history of the muzzleloading rifle or a particular type of muzzleloading rifle and report on it to your group or another interested person.
3. Experiment with different loads in your rifle. Try to find the most accurate load. Record your results and exhibit them in tabular form.
4. Demonstrate proper cleaning procedures for a muzzleloading rifle to an appropriate audience.
5. Outline muzzle loading range safety in a series of signs or posters and display them in an appropriate area at your host club or range.
6. Participate in a muzzle loading hunt or re-enactment of your choice. Record the event in your journal and exhibit it at an appropriate event or give an illustrated talk about it.

Lesson 3 Narrative

History of Black Powder and Muzzleloading Arms

The history of muzzleloaders goes back to ancient China and the discovery of black powder. The mixture of sulfur, charcoal and saltpeter was used in fireworks for some time. The first written account of black powder was published in England in 1242 AP Roger Bacon. Within a few years a German monk, Berthold Schwartz, developed black powder for use as an explosive and a propellant for firearms. He is also thought to have developed the first European firearm early in the 14th century. Most 14th century firearms were hand cannons and larger artillery pieces. By 1346 cannons were used on the battlefield, but the longbow was still the basic war weapon.

The first black powder arms were fired by inserting a glowing wire into a touch hole. Next came a trigger-operated system that lowered a burning fuse or "slow match" into a priming pan charged with a small amount of fine powder. These matchlock arms, like the blunderbuss arms associated with the Pilgrims, were demanding. The hunter or soldier needed a source of flame, relatively calm wind conditions, dry weather and a still target. Matchlock arms were not very practical as either hunting or military arms but they were the dominant arms from early in the 15th century to the middle of the 17th century.

Two designs that used steel sparks for ignition followed the matchlock. The wheel lock was a complicate and expensive design, which operated on the same principle as modern lighters. It was made by a clockmaker. It was complicated to make and had many small parts. It was a practical sporting arm, but the cost placed it out of reach of most people. A spring was wound and held in place by a sear.

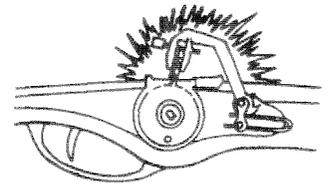
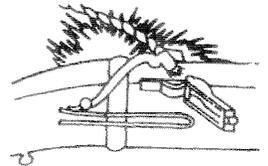
When the trigger was pulled, the spring rotated a serrated steel wheel against a piece of iron pyrite creating a shower of sparks. The sparks ignited a priming charge of black powder that fired the main charge. Wheel locks had quicker ignition and were more reliable than matchlocks. The iron forge was used to make gun metal and metal forms for tools.

Flintlock arms had replaced most other types by the middle of the 17th century. Rather than using the complex clock works of the wheel lock, the flintlock used a spring to strike a flint against a hardened steel frizzen. The steel sparks were deflected into a priming pan, igniting a priming charge that ignited the main charge. Flintlocks were the standard for the next 150 years, and they continued to be widely used for 50 years after the introduction of the caplock.

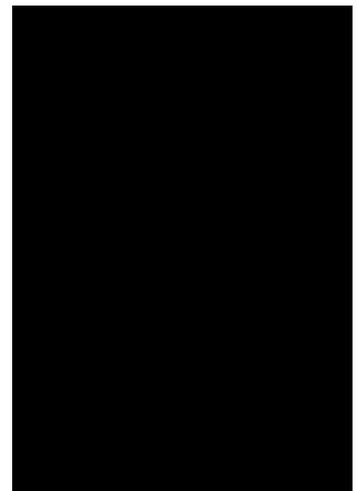
The caplock was invented around 1820. An explosive mixture of fulminate of mercury enclosed in a copper *cup* provided the spark to ignite the main powder charge. The lock mechanism itself changed very little from the flintlock to the caplock. The cock became a hammer, often with a cupped head to control the direction of any copper fragments. Upon firing copper

Fact Sheet

Mechanical ignition systems operate together to form matchlock flame-wick.



First Industry Grafton, N.H.



cap may rupture and fragments may escape. The priming pan and frizzen were replaced with a nipple to hold the cap, and the cap took the place of the priming charge. Caplock or percussion arms were more weather resistant than flintlock arms, increasing their reliability. The age of percussion arms was relatively brief, because breech-loading arms with fixed ammunition followed rather quickly.

Black Powder and Black Powder Substitutes

Black powder and its substitutes are the only types of powder that should be used in muzzleloading firearms. Some examples of substitutes include Pyrodex and “777”. Smokeless powders should NEVER be used. Smokeless powders generate pressures that are much too high for the open systems found in muzzleloading arms and their use may have catastrophic results.

Black powder is a low-yield explosive. That does not mean that it can be taken lightly or abused. It is quite powerful, but produces pressures that are tolerable in firearms with an opening at the breech. Improper procedures in loading black powder can result in serious pressure problems that could cause damage to the firearm and/or the shooter or bystanders.

Black powder is black in color, but it is the composition of the powder rather than its color that make it black powder. Most propellant powders are black or gray in color. The label should state both the type and granulation of the powder. DO NOT USE any smokeless powder in a muzzleloader even if the powder color is black.

Black powder has changed little in composition since its discovery. It is still a mixture of sulfur, charcoal and potassium nitrate (saltpeter). The mixture is ground into particles that are graded by granule size. Although all black powders burn explosively fast, the size of the granules control the burning rate and the use of the powder. Industry standards govern the size granules in each grade of powder. The coarsest sporting powder is Fg, or single Fg. It is used in shotguns 10 gauge or larger. Double Fg or FFg powder is finer. It is used in 12 gauge or smaller shotguns and rifles .50 caliber or larger. Triple F or FFFg powder is used in pistols and rifles under .50 caliber. It is finer and faster burning than FFg. It can be used as pan powder in flintlocks if necessary. FFFFg or four Fg is very fine powder. It is never used as a main charge because it might produce dangerous results. It is primarily used as priming or pan powder for flintlock arms.

Black powder is relatively unstable. It is sensitive to heat and pressure as well as sparks or flame of any kind. It is also hygroscopic – it absorbs moisture from the air. Wet powder does not ignite properly. Proper storage is essential for safety and containers must be closed between shots while on shooting range.

Pyrodex, a modern powder designed for use in muzzleloading arms, is manufactured by the Hodgdon Powder Company. Pyrodex is harder to ignite than black powder, so its use should be restricted to percussion arms. Pyrodex produces results similar to an equal volume of

Smokeless powders should NEVER be used. Excessive amounts of black powder can turn the firearm into a bomb, so follow manufacturer's recommendations on powder charges precisely.

FFFFg or four FG is very fine powder. It is never used as a main charge because it might produce dangerous results.

black powder, so the same powder measure may be used for both types of propellant

Percussion Caps

Percussion caps are open cups of copper or gilding metal containing a small amount of pressure sensitive explosive. Several compounds may be used to provide the spark, but all of them are explosive. They are sensitive to both pressure and heat, and they are all damaged by exposure to water or oil. Percussion cap sizes are not standardized among manufacturers, but usually rifles use size 10 or 11 caps. The cap should fit snugly on the nipple. Musket caps are all the same size. Some new muzzleloading rifles use a musket cap for ignition. **Always** check the rifle to determine the type of cap to be used. Since the caps are exposed to the pressure of their own firing plus that of the main charge going off, the lightly constructed metal cup may come apart during firing. The potential for flying cap fragments and the blow-back of gases from the nipple or flash hole increase the need for adequate eye protection when shooting muzzleloading firearms.

Muzzleloading Arms

People often use "lock, stock and barrel" to describe the entire thing. That phrase originated from muzzleloading firearms. The lock contains the mechanical parts of the firearm. It's attached to a lock plate bolted to the stock of the firearm.

The lock consists of the hammer or cock, several springs, a tumbler and sear, and a bridle to hold the other parts in place. The hammer is driven by the main spring. The sear is controlled by the trigger and a sear spring. Flintlocks add a frizzen spring. The tumbler may contain a fly when set triggers are used.

Flintlocks have some special components. The hammer is replaced by a cock that holds the flint between top and bottom jaws. The flint is sharpened, its position is adjusted, and it is padded with a strip of leather before the top jaw is tightened by turning the top jaw screw. The frizzen is made of hardened steel to produce an abundant spark when struck by the flint. A spring holds it in place until it is struck by the flint. It then deflects forward, allowing the sparks to shower down into the flash pan.

The trigger mechanism is protected by a trigger guard, often an elaborate one in muzzleloading rifles. The trigger or triggers are set in a trigger plate. Some muzzleloading arms have a single stage trigger. Others feature set triggers, either a double-stage trigger or a set trigger and a firing trigger. Other triggers include set back trigger, front trigger and sensitive target trigger. Those with set triggers usually have an adjustment screw that sets the tension on the firing trigger.

The stock provides the handles for the firearm. The butt stock holds the firearm against the shoulder or hand. The butt of the

firearm often has a curved butt plate of brass, steel, horn or plastic. The side of the stock often has a hinged compartment, known as a patch box. The top edge of the butt stock is known as the comb. It provides a support surface for the face or cheek during firing. The grip area of the butt stock, usually just behind the tang or breech plug, is called the wrist. Some of the references may call it the grip or small.

The forend or forearm of the stock holds the barrel in place and provides a control surface for the forward hand. Many muzzle-loaders have a barrel wedge or wedge pin that inserts in a channel in the stock and runs through a slot in a barrel lug. In combination with a hooked breech, this holds the barrel to the stock. The sides of the slot or channel are guarded and reinforced by escutcheons, small metal plates inset into the stock. The end of the stock is often capped by a metal forend cap. Usually the internal structure of the stock and forend cap are milled out to accommodate the ramrod.

The barrel is similar to the barrels of other firearms except that the breech is closed by a plug. The arm is loaded through the muzzle, and the load is pushed down firmly against the breech. The breech plug is threaded firmly against the barrel. At the rear of the barrel, a threaded insert continuing the flash hole (flintlocks) or either a snail and nipple or drum and nipple arrangement (percussion) channels the spark into the powder charge. The rear of the breech plug inserts into a slot in the tang, which is a metal brace attached to the butt stock. The barrel may feature one or more thimbles, tubes that support the ramrod, on its underside. Usually the sights are mounted on the top flat of the barrel, although some types of rear receiver sights may be mounted on the tang. Telescopic sights may be used on muzzleloaders, but most feature some type of metallic sights. Primitive sights are simple notch and blade arrangements. Adjustments are usually made with a drift punch or file. Adjustable open sights usually feature either a Partridge-style square notch and blade or a bead and notch arrangement. Peep or receiver sights may be mounted on the tang or the barrel, and a front globe sight may be used in some cases. The ultimate in peep sights is the tube sight, which resembles a long telescopic sight without glass.

The ramrod is essential to shooting a muzzleloader. As a result, almost all muzzleloading long guns have a provision for mounting the ramrod while the gun is being carried. Ramrods may be made of metal, wood or synthetic materials. **IN 4-H WE NEVER USE A WOOD RAMROD FOR LOADING OR CLEANING.**

Types of Muzzleloading Firearms

Muzzleloading shooters can use handguns, rifles, shotguns and muskets or trade guns. Muzzleloading pistols can have a single barrel, multiple barrels or a revolving cylinder that is loaded from the muzzle end. Cap-and-ball revolvers gave the black powder shooter additional firepower. Other types of muzzleloading pistols feature either caplock or flintlock design.

Muzzleloading rifles feature rifled barrels with a relatively slow twist. Although muzzleloading rifles may be located with barrels from approximately .22 to in excess of .60 caliber, the most common borings are .21, .36, .45, .50, .54 and .58. In general, .45 caliber and smaller arms are used for hunting small game. Rifles .45 caliber and larger are used in hunting big game. All of them can be used in target shooting. Muzzleloading rifles may fire round, patched balls, mini balls or a variety of newer, flat-based bullets.

Muskets are smooth-bored arms used with either a single projectile or a shot charge. They were often the arms of choice in military applications because they were easier and quicker to load than rifles. Muskets often have large bores, up to .69 caliber or larger.

Muzzleloading shotguns or fowling pieces are constructed with lighter barrels and designed to shoot charges of fine shot. They may be either single-barrel or double-barrel guns. Some modern muzzle loading shotguns have choked barrels to increase range and pattern density. Many muzzleloading shotguns are cylinder bore guns because that straight boring makes loading easier. These arms may be used in hunting or in target shooting games.

Muzzleloading Accessories

Muzzleloader shooters must understand and perform the actions of modern handloaders and shooters for each shot. Greater care is necessary because the barrel is accessible only from the muzzle. The shooter must carry more equipment into the field. They must be prepared to load and fire, and be prepared to solve any problems that may arise in ordinary use. Many muzzleloader shooters carry a possible bag, a leather pouch holding ALL the items they might possibly need for the day afield or on the range.

In addition to the balls, shot or bullets that will be used, the shooter needs a bullet pouch or bag to keep them under control. A bullet board or loading block with pre-lubed or patched bullets ready to be loaded may be helpful. Most shooters carry bullet lube or patch lubricant in their bags. If round balls are used, the shooter needs to have pre-cut patches of the appropriate type, size and thickness or patching material and a patch knife. Patches should be cotton or linen. Synthetic materials may foul the bore with residues that are very difficult to remove. A ball starter is needed to get the ball moving down to bore. The ball starter usually has both short and long shafts of starting the ball before using the ramrod. Shotgunners need shot and a series of wads. The gases produced by the powder are contained with an over-powder wad. The shot is cushioned by lubricated fiber wad, and held in the barrel by a thin, card, over-shot wad. Some old-time shotgunners preferred paper from wasp nests for over-shot wads.

Flintlock shooters must carry two types of powder in separate flasks or horns. Since only small amounts of priming powder are needed,

*Fact Sheet #8:
Accessories*

T/C handout

the priming flask or horn can be quite small. For safety reasons it should be distinctly different from the flask or horn containing the powder for the main charge. Users of percussion arms need only the single supply of powder, but they must have a supply of percussion caps. Regardless of the type of arm being used, powder must be carefully measured in a horn, brass or similar non-sparking material. Powder is never poured into the firearm directly from a horn or flask.

Regardless of the type of arm being used, powder must be carefully measured in a horn, brass or similar non-sparking material. Powder is never poured into the firearm directly from a horn or flask.

To fire the muzzleloader, the shooter needs tools and equipment for the appropriate type of ignition system. Flintlock shooters need spare flints and the tools necessary to change or sharpen and adjust flints in the field. Caplock shooters need percussion caps. A spare nipple is a wise precaution, and a capping tool makes capping easier and more consistent. A nipple wrench and a nipple prick or pick for cleaning out the small hole in the nipple is needed. Some shooters carry a piece of fine copper wire for this purpose, others prefer piano wire or similar stiff material. Flintlock shooters need a similar tool for cleaning fouling from the flash hole.

All shooters should carry equipment to clean their guns in the field. A combination patch lubricant and black powder solvent is an excellent choice. Cleaning patches, a cleaning jag to fit the bore and the jag and a worm for retrieving lost patches will all be needed. A ball puller is a necessity in case powder becomes fouled after loading or if a ball or bullet gets loaded without a powder charge.

Differences in Muzzleloading and Cartridge Arms

Muzzleloader shooters need a possibles bag for the little items that could quickly fill all their pockets. These items are vital to having a good time shooting. Muzzleloading is a lot more complex than shooting cartridge firearms. Muzzleloaders must know and practice all the elements of both loading and shooting safely. Returning to an earlier level of technological development in shooting demands more of the user. Care and attention to detail in learning this earlier technology is important. Develop sound basic habits and ask questions while learning to use these tools.

Summary

In this session we explored the history of black powder and muzzleloading arms briefly. We followed the development of several types of ignition systems, from the matchlock and wheel lock to the flintlock and percussion arms more commonly seen today. We compare the basic parts of these arms with those of cartridge guns, noting that the lock, stock and barrel describe the basic components of muzzleloaders. We also noted that muzzleloading arms cover all types: pistols, rifles, shotguns and muskets. The shooter needs a wide array of accessories to load, fire and field clean their gun. Those accessories make shooting both easier and safer. The basics of muzzleloading safety will be considered next time.

Summary Activities

1. Allow the participants to handle and study the materials used in the lesson.
2. If an adequate range is available, have an adult or teen leader load and fire a muzzleloader while the process is explained and the equipment is described.
3. Play an identification game with the parts of the muzzleloaders and their accessories.

Exhibit or Sharing Ideas

1. Develop posters showing the parts of a muzzleloader, including diagrams of various ignition systems.
2. Demonstrate the parts of a muzzleloader to an interested adult or another audience.
3. Demonstrate the use of muzzleloading accessories to an adult or another interested person.
4. Discuss the differences between shooting muzzleloading firearms and cartridge firearms of the same type.
5. Study the history of muzzle loading firearms or black powder. Relate that history in a report, illustrated talk or presentation to your shooting sports group.
6. Study the local history of muzzleloader or powder manufacturing. Relate that history to other historical events and period dress. Share your findings with an interested audience in your school or shooting sports group.
7. Reenactment of a local event or living history

Lesson 4 Narrative (Optional)

Muzzleloading Shotguns

Bore size is standard but barrel ID may vary between manufacturers. US made are the same as 12g standard but foreign barrels may vary.

Modern shotguns and muzzleloading shotguns share most characteristics. Both types of firearms have smooth bores designed to fire multiple projectiles at moving targets. They share basic components like a stock, barrel and action or lock. Some manufacturers offer screw-in choke tubes. These cylinder bore guns shoot wide patterns with low-pattern density by modern standards. The loads often produce slightly lower muzzle velocities, which may tighten the pattern slightly. Effective range is reduced because of the low-pattern density and lower pellet energy. That loss of velocity also requires a slight increase in loads and increases importance of a strong follow through.

Muzzleloading shotguns come in several varieties. Shotguns were designed specifically for shooting at moving game. **Trade guns** were inexpensive smoothbores that were traded with the Indians during the height of the fur trade. They were used with either a single ball or with shot. **Muskets** were smoothbore military arms that could be used with shot or a large round ball. Shotguns and trade guns have no rear sight. They are pointed like a modern shotgun. Rather than a set trigger arrangement often seen in rifles, they have a single trigger for each barrel. Both single-barrel and double-barrel shotguns are available.

As with modern shotguns, bore size is now standard for different gauges. Gauge was determined by the number of bore-diameter balls that could be cast from a pound of lead. Standardized gauge diameters make obtaining proper wads relatively easy.

Muzzleloading Shotgun Safety

All the fundamental rules of safe firearms handling also apply to muzzleloading shotguns. Everyone on the range must wear eye and ear protection. Shooters and bystanders must exercise self-control at all times. The muzzle must be pointed in a safe direction at all times, never at anything the shooter does not want to shoot. Never place fingers on the trigger until ready to fire, and do not load the shotgun until ready to shoot. Cap the percussion lock or prime the flintlock only when on the shooting station or firing line. In the field, the shooter is responsible for proper and complete target identification. The responsibility for the safety of any shot rests with the shooter.

All the fundamental safety rules for handling black powder and muzzleloading arms apply. Minimize exposure of the body to risk. Avoid flames or sparks. Load from a separate powder measure that yields a carefully measured charge of the proper powder granulation. The powder must be stored and handled safely at all times. Finally, practice a sound and safe loading procedure every time.

In addition to these general rules, the rule of any shotgun shooting game must be followed. That is particularly true of any rules that pertain to the safety of the shooter, range personnel and bystanders.

Loading Muzzleloading Shotguns

Appropriate power granulation changes with the bore diameter of the shotgun. Ten gauge guns use Fg powder. Shotguns from 12 gauge to 20 gauge should use FFg. Shotguns 20 gauge or smaller should use FFFg. Note that the 20 gauge may be loaded effectively with either FFg or FFFg.

Powder charges for shotguns are commonly expressed in drams of black powder. The dram is a unit of volume used in the past for apothecary or pharmaceutical measure. Modern shotshells refer to the dram-equivalent of their smokeless powder charge. Although the historical measure is in drams, most powder is now measured in grains. One dram is equal to 27.5 grains and one grain weighs 1/7000 of a pound. A basic rule of thumb for shotgun shooting is to use equal volumes of powder and shot. The light, starting loads suggested here approximate that rule of thumb. All shotgun gauges may successfully use Pyrodex RS. Pyrodex should not be used in flintlock shotguns. Follow manufacturers suggested loading information usually describes in gr weight.

A set of wads is used to seal the gases behind the shot and to cushion the shot as the charge is fired. The over-powder wad is a thin, nitro card wad. Wads about 2 to 3 cm ($1/16$ to $1/8$ inch) thick are a good starting point. A felt or fiber wad treated with a lubricant or soaked in water or solvent is seated on top of the nitro wad. Felt wads 6 to 18 cm ($1/4$ to $3/4$ inch) thick work well. All wads should fit the bore tightly and be seated firmly on the powder or shot.

Plastic wads are *not* recommended. They may leave a buildup of plastic material in the bore, and some manufacturers will not honor a warranty if plastic wads have been used in their shotguns.

Plastic wads are not recommended.

The shot charge should be within the manufacturer's recommended limits for the shotgun. Most field shooters tend to use one shot size larger than they would normally use in a breech-loading shotgun when hunting. The heavier shot is used to partially compensate for the slightly reduced muzzle velocity and lower pellet energy. Maximum pattern dispersion is achieved with soft shot or drop shot. Chilled lead or magnum shot produce somewhat tighter patterns. Most manufacturers do not recommend soft iron or steel shot for muzzleloading shotguns.

The load is completed by seating a thin card wad to hold the shot in place. Very thin nitro wads (split nitro wads) or wads cut from thin cardboard work well. Some shooters prefer paper from wasp nests.

Suggested loads start with an approximate equivalent of maximum target loads. The 10 gauge load is 89 grains of Fg (about $3\frac{1}{4}$ drams) and $1\frac{1}{4}$ ounces of shot. A heavy load in the 10 gauge might go as much as 109 grains of Fg (4 drams) and $1\frac{3}{4}$ ounces of shot. The 12 gauge uses FFg powder- 76 grains ($2\frac{3}{4}$ drams) in the light load behind $1\frac{1}{8}$ ounces of shot and 89 grains ($3\frac{3}{4}$ drams) in the heavy load behind $1\frac{1}{4}$ ounces of shot. In the 16 gauge the starting load features 61 grains of FFg ($2\frac{1}{4}$ drams) behind 1 ounce of shot.

The 20 gauge uses about 55 grains of FFg (2 drams) with a ¾ ounce shot charge up to 69 grains (2 ½ drams) of FFg and a 1 ounce shot charge. The little 28 gauge can drive a target load of ¾ ounce of shot with 47 grains of FFFg (1 ¾ drams) or shoot a heavy charge of 1 ounce of shot with a 61 grain powder charge. Remember to start with the lighter loads and work up to the most effective load for your purpose. Change only one component at a time and record the results of each shot. Do not exceed the manufacturer's published limits.

Loading Procedures

Remember that all the basic precautions for loading muzzleloaders apply to shotguns. Minimize the exposure of your hands, head and body to the muzzle. Minimize the amount of powder exposed at any time. Keep the muzzle pointed in a safe direction at all times, and establish a standard loading process that will keep your loading safe.

Start by setting your measure and/or selecting a scoop that will deliver the proper powder and shot charges. Then check the shotgun to see that it is empty and safe. Swab the bore with an alcohol moistened patch. Use a dry bore mop or patch to dry the bore completely. Clear the nipple by firing several caps (muzzle pointed in a safe direction and watching for gas movement at the muzzle) or clear the flash hole with a pipe cleaner. If a flintlock is being used, wipe the frizzen, pan and flint with alcohol and dry them thoroughly.

Pour the proper amount of powder into the measure or scoop. Cap the container and pour the powder into the barrel. If a double barrel is used, place the ramrod in the empty barrel to avoid double charging one side. Seat an over-powder wad and a lubricated fiber wad firmly on the powder. Release the ramrod and watch for it to rebound. If it does, apply more pressure to seat the wads completely on the powder. Repeat this process until the ramrod stays in place. Place the ramrod back in the empty barrel, then measure the proper shot charge and pour it into the barrel. Insert an over-shot wad and ram it home firmly as before, watch for any rebound on the ramrod. The charge should be firmly in place, but do not bang on it or use excessive pressure. That will only deform the shot and produce erratic patterns. Once this barrel is loaded, transfer the ramrod to the loaded barrel and repeat the process with empty one. Once the barrels are loaded, replace the ramrod and wait your turn on firing line. Do not cap or prime the shotgun until you are on the shooting station or firing line. Maintain proper muzzle control at all times.

Shotgun Shooting

Shotgun shooting form involves an aggressive, boxer's stance. The weight is shifted forward and the body leans into the shot until the head is over the front foot. The elbows are held nearly parallel to the ground to provide better freedom of movement. The shotgun is brought to the face and shoulder in a consistent mount. When the target appears, the shooter swings to the target, establishes a lead, fires and follows through. *[Instructor's note: consult the basic shotgun shooting lessons for these fundamentals if the shooters are not familiar with sound shotgun shooting form.]*

Muzzleloading shotguns place some limit on the shooter. The combination of cylinder bore patterns and lower velocity reduces their effective range on targets or game. Target or game birds will require slightly more lead and a more pronounced follow through for consistent hits. In field situations, the shooters may need to restrict their shooting to closer shots than would be possible with a tightly choked breech-loading gun.

Range Management

Standard range commands should govern shooting on the firing line. [See the shotgun lesson plans for additional information.]

Since loading requires more time with muzzleloaders than with breech-loading shotguns, the shotgun maybe charged with powder and shot prior to reaching the shooting station IF it can be done safely and with the muzzle pointed away from all other persons. The shotgun should NOT be capped or primed until the shooter is in position and ready to call for the target.

Misfires or hang-fires should be treated as they were with muzzleloading rifles. Keep the muzzle pointed down range with the shotgun held on the shoulder for at least two minutes. Disable the shotgun by removing the caps or priming powder and shielding the nipple or frizzen. Keep the muzzle pointed in a safe direction while treating the problem. Use the sequence of actions described with muzzleloading rifles to dispose of the reluctant charge. On a temporary cease fire, disable the shotgun. Remove the cap or priming powder. Cover the nipple or frizzen with leather and lower the hammer into fired position. Insert a pipe cleaner into the flash hole of the flintlock for added security. At the end of a shooting session, empty the shotgun in a safe direction.

After Shooting

After the firearms are emptied, collect and store all equipment. Arrange the shotgun cleaning materials in a convenient place and prepare to clean the shotguns. Remove the barrels and locks from the stock, and remove the nipples from the barrels. Scrub the barrels and locks thoroughly with hot, soapy water using a bore mop or cleaning jag and patches. Rinse them with hot water and dry them with dry patches, alcohol-moistened patches and additional dry patches. Lightly oil the inside of the bore and all metal surfaces, wiping away any excess oil. Reassemble the firearm and store it in a dry, secure area. Many shooters like to inspect their muzzleloaders again after about 24 hours, cleaning it once more if necessary.

The shotgun should NOT be capped or primed until the shooter is in position and ready to can for the target.

. . . Keep the muzzle pointed in a safe direction while treating the problem.

Summary

Smoothbore muzzleloaders come in several varieties - musket, trade gun and shotgun in either percussion or flintlock designs. Shotguns are available in single-barrel or double-barreled designs. Shotgun safety and loading are very similar to the practices used with rifles. The shooter loads a measured powder charge, a pair of wads (over powder and lubricated fiber), a shot charge and an over-shot wad, seating the entire load firmly. A standard loading system is used to keep everything straight, and the ramrod is used as a signal device in doubles to help the shooter remember which barrel is being loaded at the time.

Shooting muzzleloading shotguns is much like shooting breech-loading shotguns. Lead and follow through are a bit more critical. Cylinder bore guns have a shorter effective range, and shot size may need to be increased slightly to add killing effectiveness on game. Shooting form, however, is the same.

Shotguns are cleaned much like rifles, and immediate cleaning is essential. Storage considerations are the same as for other firearms.

Summary Activities

1. Have shooters shoot several clay targets with muzzleloading shotguns. Then they should clean and prepare the arms for storage.
2. Introduce a shotgun game, either formal ones like trap or skeet or informal ones like riverside skeet or clover clays. Have the shooters fire one round of the selected game.
3. Use muzzleloading shotguns to complete basic shotgun lessons.
4. Hold a shoot or tournament where only muzzleloading shotguns maybe used.

Exhibit or Sharing Ideas

1. Demonstrate or discuss muzzleloading shotgun safety, shooting or cleaning in an appropriate setting,
2. Record the things you learned in this session in your shooting journal. Exhibit the journal in an appropriate event or activity.
3. Demonstrate or give an illustrated talk on some aspect of muzzleloading shotgun shooting.
4. Prepare a set of posters on muzzleloading shotgun shooting, cleaning or safety for exhibition and posting at the host club or range.
5. Research the history of muzzleloading shotguns or shotgun sports and report them back to your group or another interested person.

Lesson 5 Narrative (Optional)

Black Powder Handguns

The most common types of black powder handguns are single-shot pistols and cap-and-ball revolvers. The pistol is like a muzzleloading rifle in design and function. The main differences are the design of the stock and the length of the barrel. The pistol is designed to be held in the hands rather than on the shoulder, and the barrel is much shorter.

Pistols are available in both percussion and flintlock designs. They are loaded and fired like rifles using the same ignition system. The primary differences are the use of a loading stand, a device to hold the pistol in place while it is being loaded, and the way the pistol is held for shooting.

Muzzleloading handguns are used in target shooting, recreational shooting, re-enactments and in small game hunting. Their use on big game or larger small game animals is not recommended.

Muzzleloading Handgun Safety

As with other muzzleloading arms, the muzzle loading handgun shooter must follow all the safety rules for loading and shooting handguns. Handguns require greater attention than shoulder arms to prevent unsafe situations from developing. The short barrel is easily moved about, so attention to muzzle control is absolutely essential. This requires undivided attention. No part of the body should be forward of the cylinder after it has been loaded.

The basic rules for safe handling of black powder must be followed during loading. Shooters must be sure the powder is the correct type or granulation. They must use a charge within the limits defined by the manufacturer. The amount of powder exposed must be kept to a minimum, and the loading and firing area must be free from sparks or flame. Black powder must be loaded from a measure separate from the powder can, flask or horn.

During the loading process the shooter must minimize exposure of head, hands and body to risk. The muzzle must be pointed down range slightly and away from all persons. A loading stand helps ensure safe loading. It holds the pistol securely in place and acts as a third hand during loading. Powder is carefully measured, and the patched ball or tight-fitting ball is seated firmly on powder.

All range control and shooting safety rules apply to this situation as well. Shooters must keep the muzzle of the firearm under control at all times, ensuring that it is pointed in a safe direction. Load only when the range is clear and you are preparing to fire. The cap or priming powder is put in place just before firing a shot. The trigger finger stays off the trigger and covers the trigger guard until the shooter is ready to fire. A safe zone of fire and adequate backstop should always be determined before firing. Safety is the personal responsibility of every shooter, and self-control is the key to responsible shooting.

Loading and Firing Muzzleloading Pistols

Single-shot muzzleloading pistols load just like rifles. The first step in loading is to ensure that the pistol is empty. Make sure that the pistol is deactivated (no cap on the nipple or priming powder in the pan) and check the barrel with a pistol rod. Fix the pistol securely in the loading stand. Swab the bore with a patch moistened with alcohol, then use a dry patch to clean and dry it. Clear the nipple by firing several percussion caps or clean the frizzen, flint and pan with alcohol, dry them thoroughly and clear the flash hole with a pipe cleaner. Measure and load the powder charge using a measure separate from the stock container. Be sure the granulation and powder charge are correct. Place a lubricated patch on the muzzle of the pistol, center a ball in the muzzle with the sprue facing up and start the ball into the bore with the short starter. Use the long arm of the pistol rod to seat the ball completely on the powder. Remove the pistol from the loading stand, being careful to keep the muzzle in a safe direction. After taking a position on the firing line, cap or prime the pistol and prepare to fire.

Shooting a muzzleloading pistol is much like shooting any other pistol. The shooter must take a proper stance for the grip being used – square to the target for a two-handed grip and with the shoulder pointing toward the target for a one-handed grip. The grip should be firm. Target shooters normally use a one-handed grip, shooting from the dominant side. Recreational shooters often prefer to use a thumb-lock grip or a palm-rest grip with both hands. Cock the pistol with the off or non-dominant hand. Align the sights, raise the pistol into firing position and obtain a proper sight picture. Squeeze or press the trigger straight back while keeping the sights aligned and maintaining the proper sight picture. Hold the sight alignment through the shot in the follow through.

Misfires or hang-fires should be handled as they were with rifles. Start by keeping the pistol pointed down range for at least two minutes. Deactivate the pistol by removing the cap or pan powder, covering the nipple or frizzen with leather and lowering the hammer gently into the fired position. Check the seating depth of the ball to determine the pistol's status.

If the *pistol* has been loaded without powder, two options may be tried. A few grains of powder may be worked into the barrel through the nipple or flash hole in an attempt to shoot the ball free. Another method is to use a short work rod with a ball puller to pull the ball and permit loading properly.

If the pistol is properly loaded, a series of steps should be tried. First, after checking to see that the ball is properly seated, inspect and clean the nipple or flash hole, frizzen and flint. Prime the pan or place a cap on the nipple and attempt to fire again. If the pistol still refuses to fire, try working a few grains of powder into the flash hole or nipple channel and try to fire again. Be prepared for a delayed ignition. Finally, deactivate the firearm, remove the nipple and place the breech end of the barrel in a bucket of water for at least an hour before attempting to pull the ball. Then clean the barrel, dry it completely, load properly and attempt to fire again.

Swab the bore between shots to remove fouling. After the shooting is finished for the day, *clean* the pistol thoroughly before storing it. The same techniques used to clean a rifle may be used with muzzleloading pistols.

Summary

In this session we studied, loaded, fired and cleaned single-shot muzzleloading pistols. As in the other shooting session we reviewed safe handling of black powder and muzzleloading arms, shooting safety and safety precautions associated with the type of arm being used. The uses of black powder pistols were also reviewed, noting that they are not recommended for hunting big game but are useful in target shooting, recreational shooting, re-enactments of the appropriate period and occasionally as small game hunting tools.

Summary Activities

1. Have shooters fire and clean a muzzleloading pistol.
2. Discuss the uses of these types of firearms and the reasons they might not be used for other purposes.
3. Hold a fun shoot using muzzleloading handguns.
4. Have a re-enactment, buck skinning or other historical group perform or discuss what they do and why they do it.

Exhibit and Sharing Ideas

1. Demonstrate the loading and/or cleaning process for either a muzzleloading pistol or a cap-and-ball revolver.
2. Research the history of handguns and share your findings with your club or another interested person.
3. Share what you have learned in this lesson with another person interested in muzzleloading.
4. Write what you have learned in your shooting journal and exhibit the journal in an appropriate activity or event.
5. Give an illustrated talk about the use of muzzleloading handguns.

