4-H S.A.F.E.T.Y.
An Introduction to Muzzleloading Firearms

MISSISSIPPI STATE UNIVERSITY EXTENSION

S·A·F·E·T·Y
SAFE ARCHERY & FIREARMS EDUCATION & TRAINING FOR YOUTH

A buckskin-clad hunter in a skunk skin hat slips quickly along a woodland trail. Suddenly he freezes, shoulders his flintlock rifle, and fires. As the cloud of white smoke clears, he notes the bullet has hit well. No, he's not a frontiersman of long ago; he is a member of an emerging group of modern shooters and hunters—those who prefer to use muzzleloading firearms in the pursuit of their sport.

American history is deeply intertwined with the development of firearms, and improved muzzleloading arms were key elements in the nation's development. Frontiersmen explored the West, land west of the Appalachian Mountains, carrying Kentucky (or Pennsylvania) rifles. Their long, light, and accurate rifles were adequate when wildlife up to the size of white-tailed deer and bears were staples of the frontier diet. Those rifles were inadequate for the Louisiana expedition led by Lewis and Clark. Bison and grizzly bears required heavier loads with larger bullets, and horseback travel made a shorter rifle desirable. The Hawken plains rifle answered that need and served those who explored the Great Plains and Rocky Mountains.

Only when breechloading arms were developed in the middle of the 19th century did muzzleloaders begin to decline. The superior loading speed and convenience of the breechloader made them more desirable. Now, a century later, shooters are rediscovering muzzleloading arms—reliving history and having fun.

Let's look at these arms and how to use them.

Objectives

To help students understand and experience:

- muzzleloading terminology and names
- black powder and lead balls
- equipment required
- additional safety procedures involved in black powder handling and muzzleloader shooting
- loading and firing procedures and principles
- cleaning procedures

Teaching Time

2 hours (varies with number of students, instructors, and firearms)

Materials

As any muzzleloading shooter knows, there are many equipment needs, including:

- Flintlock rifle or shotgun
- Caplock rifle or shotgun
- Black powder and container (assorted sizes suggested)
- Smokeless powder and container
- Pyrodex and container
- Ceramic or metal dish for burning powder
- Matches
- Flints
- Percussion caps
- Capper
- Powder horn and/or flask
- Powder measure
- Precut patches
- Patching muslin
- Poly patches
- Bullet bag
- Round balls
- Maxiballs
- Patch lubricant (shortening)
- Ball starter
- Ball puller
- Worm
- Patch knife
- Possibles bag

Necessary Equipment

Whether preparing to shoot percussion cap (caplock) or flintlock, you need more than firearm powder, ball, and cap; and you must make certain that all necessary accessories are close at hand. First, you must have patching material and linen or cotton cloth of suitable thickness to wrap around the ball, forming a gas-tight seal. Do not use a synthetic fabric. It burns through quickly, allowing the ball to come in contact with the bore, causing "leading" in the barrel. The patching material should be moistened with spit, solid shortening, or a commercial lubricant, and cut into individual patches or carried in strips a little more than an inch wide. Carry a sharp knife or razor to trim the excess patching from around the ball after seating.

You need your powder horn or flask just as badly as did your marksman ancestor. It is generally made of steer or buffalo horn, stag horn, brass, or copper. Plastic reproductions that look as authentic as the real thing are now available. You need a powder measure, made of brass to prevent sparks, for determining the right charge for the job at hand. On a hunting trip, you can carry premeasured powder loads in small plastic pill containers or individual paper tubes twisted at each end. A quick bite will open the tube, and you can pour the powder down the bore.

You also need a short and long starter, normally combined in one tool. The short starter gets the ball firmly fixed in the muzzle, and the long starter is used to get it under way down the barrel. Then, of course, you need the long ramrod, which is considered part of the gun. Special devices that can be screwed into the threaded tip of the rod are used with the ramrod. One such tip, of corkscrew design, is used to remove cleaning patches stuck in the bore. It is called a worm. Should it be necessary to clear or unload the gun without firing, a screw-tip, or ball screw, is used. The jag is a buttonlike device used to hold a cleaning patch.

You also need a nipple prick or vent prick, a length of wire small enough to be inserted through the vent hole (in a caplock) or the flash hold (in a flintlock) to clear any powder fouling or other obstruction. Carry a nipple wrench to replace a broken nipple or to permit loading from the breech if clearing the barrel is necessary.

Two other accessories you'll find valuable are a small strip or disk of leather, punched with holes to securely hold extra caps, and a loading block containing prepatched and lubricated balls. Both of these devices are helpful in fast loading.

Finally, you'll need a shoulder bag or pouch, called a possibles bag, in which to pack your many accessories.

Powder and Ball

Just as different cartridges and shells are needed for various types of shooting with breechloaders, muzzleloaders require different loads for hunting and target practice.

Black powder comes in four types, with the differences in the fineness of granulation. Fg is very coarse and should be used in muskets with bores as large as .70 caliber, such as the Brown Bess.

The next coarsest black powder is FFg and is used in most muzzleloading shotguns and big bore rifles and pistols from .540 caliber to .690 caliber.

The most frequently used black powder, however, is the faster burning FFFg used in practically all cap and ball revolvers, single shot pistols, and rifles ranging from .36 caliber to some .54 caliber pieces.

The finest of the black powders, FFFFg, is seldom used except for priming the flash pans of flintlocks. It is extremely fast burning and creates pressures too great for most black powder guns.

Round lead balls are used in most of the muzzleloading rifles, but the conical bullet (minie ball) is the popular ammunition for most muskets. Tables giving proper bullet diameter, powder type, and the charge in grains for various firearms are available in most publications on black powder shooting.

Presentation

I. Loading and Firing Sequence

The loading and firing sequence is more complicated using a muzzleloader versus using a breechloader. Safety rules will be discussed.

1. Be sure the firearm is in perfect functioning condition. Have a gunsmith check it if you are not sure.
2. Be sure the firearm is clean. Cleaning is done in several ways. Inserting the ramrod, if it has been marked to show an "empty" line, reveals if the arm is unloaded. The ramrod can also be dropped forcefully into the bore. Empty arms let the ramrod bounce, but a load or forgotten patch causes it to stay down, since the metal-to-metal contact is padded. Both the sound and the action of the rod are good clues. Finally, many muzzleloader shooters raise the hammer or frizzen and blow through the muzzle. The sound of escaping air signals that the bore is free of obstructions.
3. Snap a couple of caps or a pan or two of powder to clear oil from the flashhole and bore. Be sure to keep the muzzle pointed in a safe direction, and wear your shooting glasses!
4. Many shooters blow through the muzzle at this point to be sure the arm is still clear and to finish off any glowing sparks.
5. Carefully pour the recommended charge of powder into a powder measure, then into the bore. Never pour directly from a large volume of powder. A spark could leave you holding a bomb!
6. Tap the butt or sides of the arm to settle the charge.
7. The arm is now ready to be primed by placing a small amount of FFFFg in the flash pan or having a cap placed on the nipple. (Using a capper and pinching the skirt of the cap slightly will keep it in place.)
8. Cock the hammer, aim, and fire. If the firearm fails to discharge, clean the flashhold, replace the cap or priming powder, and try again. If the cap lock still fails to fire, remove the nipple and put a few granules of powder in the drum before attempting to fire another time. Ignition may be delayed and accuracy suffers if the powder gets wet or oily.

II. Practical Exercise

Application (for the leader)

- ☐ This segment of the session is to be taught on the range.

- ☐ Demonstrate
  1. Inserting the ramrod.
  2. Bouncing the ramrod.
  3. Blowing through the breech.

- ☐ Demonstrate this process, making sure the instructor uses shooting glasses and observes all safety rules.

- ☐ Emphasize: correct granulation, correct charge (show recommendations), use measure.

- ☐ Demonstrate.
- ☐ Demonstrate as discussed.

- ☐ Demonstrate as discussed.
- ☐ Demonstrate removing the nipple.

- ☐ Divide into groups equal to the number of rifles. Let the first person complete the procedure while the second coaches and the third observes. Repeat the process until each person has done each task. Be sure to review range safety and be alert for potentially dangerous situations. Silhouettes or clay birds are good for this exercise.

III. Cleaning the Muzzleloading Firearm

Because the residues from black powder are extremely corrosive, muzzleloading firearms must be cleaned carefully after each use. The traditional method of cleaning the bore is to use hot, soapy water. Black powder solvents may also be used.

Hot Water and Soap Technique

1. Remove the barrel from the firearm if it can be done easily.
2. Shave strong soap or pour dishwashing liquid into boiling water and place the breech end of the barrel in the water.
3. Place a tight patch on the cleaning jag, and pump the soapy water through the bore. Be sure to do a thorough job, changing patches as needed. A glove or hot pad helps hold the hot barrel.

- ☐ Demonstrate removal of key and disassembly of the hooked breech barrel.
- ☐ Demonstrate.
- ☐ Swab the bore clean while holding it with a heavy glove.

Additional Safety Considerations

Muzzleloaders are not toy replicas. Without question, they have the same basic potential as modern cartridge guns and must be handled with care. Always remember that muzzleloaders are made for black powder and black powder only! Never, under any circumstances, should smokeless powder be used. The results can be disastrous to the shooter and firearm.

As mentioned earlier, the ball must be seated completely. Shooting with a ball lodged midway down the barrel results in damage to the piece and possible injury to the shooter.

Black powder is highly volatile and goes off in a flash from the smallest spark. Never smoke around black powder, and keep powder away from the fire in your hunting camp.

After a shot has been fired, it is possible for some smoldering residue to be left in the barrel. Never pour powder directly from horn or flask into the muzzle, because this could cause an explosion and backfire into the container. Fill a measure from the horn, and pour the contents of the powder measure into the barrel. If accidental ignition should occur, the limited quantity of powder reduces the chance of injury. Hold the muzzle away from the body during the loading process, protecting face and arms against burns if the powder is accidently ignited. The best advice is to wipe the bore with a damp patch after each firing to prevent such an occurrence.

As with all guns, it is important to be able to tell when the piece is loaded. Experienced muzzleloaders mark their ramrod at proper levels, showing bore depth when empty, when charged with a light (target) load, and when charged with a heavy (hunting) load. When the rod is inserted, the condition of the gun can be seen at a glance. This safety procedure is especially important in the use of double-barrel shotguns.

Remember that muzzleloaders are basically similar to modern firearms, and the same general safety rules and procedures apply. These have been covered in another unit, and should be reviewed along with the special safety features described here.

Muzzleloading Terminology

Muzzleloaders are much like today's firearms. Names such as barrel, stock, muzzle, bore, trigger, or hammer have been covered in a previous unit, but they apply here, as well. Using black powder, however, involves some new terms to learn and a number of unusual parts and pieces to know.

Become familiar with parts of the two basic lock systems: the flintlock and the percussion cap.

The following list of terms will help you become familiar with using a muzzleloader.

Ball—Round, lead projectile used in the majority of muzzleloading rifles and nearly all black powder pistols and cap and ball revolvers.

Ball screw—Resembling a wood screw, this attachment threads into the end of the ramrod and is used for removing the ball from the bore. The threaded point of the ball screw digs into the soft lead of the ball and grips it firmly enough so that it can be pulled through the length of the barrel.

Black powder—A mixture of potassium nitrate, charcoal, and sulphur. Combined, these ingredients form the standard propellant for muzzleloading guns.

Bore buildup—Continuous firing of a black powder rifle, pistol, or shotgun results in a buildup of powder foulings in the barrel. For regular target practice, lining of sights, or just plinking after a dozen or so shots, this is usually cleaned out with a few swipes with solvent and a jag threaded into the ramrod. Serious competitors, however, often wipe the barrels of their guns after every shot.

Breech—The rear end of a muzzleloader's barrel.

Breech plug—The threaded plug that is screwed into the breech end of a muzzleloader's barrel. This forms a gas-tight seal and is actually the rear or bottom of the chamber; the barrel tank is usually attached to the breech plug.

Cap box—Normally appears as a hinged compartment on the buttstock of a rifle or shotgun. The cap box is exactly as the name suggests—a place to carry caps. The term also was used during the Civil War to describe a small, leather belt pouch used for carrying musket caps.

Caplock—A term often used to describe a percussion lock.

Charger—A term used to describe anything—flask, horn, dipper—that measures out one exact charge of powder.

Combustible cartridge—Muzzleloading cartridge that contains the powder and projectile rolled in a paper casing. This paper is nitrated and completely combustible, and the entire unit is loaded into the gun.

Damascus barrels—Early barrels formed by welding together strips of various steels. These were wrapped and hammer-forged around a mandrel that was the same diameter as the intended finished bore—in the case of smoothbore or shotgun barrels—or on the smaller side if the finished barrels were to be rifled.

Fence—Also known as the flash guard, this small projection located on the rear of a flintlock's flash pan diverts the flash of the igniting priming powder from the shooter's eyes. Today's flintlock shooter would be wise to wear a pair of good shooting glasses in case the sparks and flame happen to bypass the guard.

Flash—As the hammer on a flintlock strikes the hardened frizzen, it results in a minute portion of molten metal falling into the priming powder located in the flash pan. This ignites the powder, causing an audible and visible flash.

Flash hole—The hole leading from the pan of a flintlock to the powder charge in the chamber; originally used to describe the vent hole on hand cannons that required igniting the round by placing or touching a burning stick or hot coal to this vent.

Flash pan—Rifles and pistols that rely on the sparking of flint against steel for ignition have a small pan located below the frizzen or striking arm. A fine granulation of black powder—FFFFg—is placed in the pan; this serves as a primer for the main charge located in the chamber ignited by the flame that shoots down the flash hole leading from the flash pan.

Frizzen—The hardened steel surface that the flint strikes to ignite the primed flash pan of a flintlock.

Fulminate of mercury—An explosive priming charge used in making percussion caps. The discovery of fulminate of mercury in 1800 led to the invention of the percussion cap around 1820.

Hang-fire—A dangerous situation, a hang-fire appears to be a misfire but discharges after a short delay and is perhaps more common with flintlocks than with caplocks. Keep the muzzle pointed downrange in case a misfire or hang-fire occurs.

Jag—An accessory that fits into the end of the ramrod to aid in cleaning the barrel. It is usually a button-like device with serrated edges to grip the cleaning patch.

Loading block—A wooden block that has been drilled with holes for carrying prepatched balls. The hole in the block is aligned with the muzzle, and the ball is seated into the muzzle with a short starter.

Minie ball or bullet—Developed into its present state by Captain C. E. Minie of France in 1848, the minie is an aerodynamically stable, cylindrical ogive bullet with hollow base. This bullet is easily seated in the dirtiest of bores, usually requiring little effort. When fired, the expanding gas of the rapidly burning powder in turn expands the hollow base of the minie into the rifling.

Misfire—When the round loaded in the chamber fails to fire, even when the cap or priming powder goes off.

Nipple—On muzzleloading cap locks, the nipple is the small metal cone that the percussion cap is fitted to. Flame from the exploding cap is passed through the nipple to the main charge of powder loaded in the chamber.

Nipple wrench—A tool used for replacing or removing the nipple from percussion guns.

Patch box—An inlaid, lidded box that is found on some of the muzzleloading rifles. They were originally intended for carrying greased patches or tallow for lubricating patching material.

Patch cutter—A circular cutter used for precutting patches. It is placed with the cutting edge down on a piece of suitable material and rapped with a mallet, resulting in a perfectly circular patch. Often confused with a patch knife, a bladed instrument used to trim excess material from around the ball as it is being seated into the muzzle.

Patching—Cloth, usually cotton or linen, used to form a gas-tight seal around the round ball loaded into a muzzleloading rifle or single-shot pistol. Patching improves accuracy by engaging the rifling, causing the ball to rotate as it leaves the muzzle and while in flight.

Percussion cap—A small, metallic cap containing a minute charge of fulminate of mercury. When placed on a nipple, the striking of the hammer causes the fulminating charge to explode, which in turn ignites the powder in the chamber.

Possibles bag—Used to carry black powder accessories.

Powder flask—Powder container commonly made of metal having characteristics of copper and brass. Occasionally made from stag horn or like materials. Powder flasks usually have some type of charger mounted on top.

Powder measure—A graduated measuring device that can be adjusted to measure different grain loads.

Pricker or vent prick—A piece of fine wire used to clear fouling or obstructions from the nipple or flashhold.

Ramrod—Usually made of wood, although brass and steel are not uncommon. Used to seat the ball over the powder charge in muzzleloading rifles. Ramrods are commonly carried under the barrel, held by ramrod thimbles.

Set trigger—A double-trigger mechanism in which the rear trigger is first pulled to set up the front trigger so that it can be released with slight pressure. This type of trigger is usually found on target rifles and occasionally on the finer hunting rifles.

Shot pouch—A container used for carrying shot; often made of leather.

Short and long starter—A short (5- to 6-inch) rod fitted with a round or flat, palm-fitting handle used for starting patched balls down the muzzle of rifles and some pistols.

Tang—Most often an extension from the breech plug, the tang is the retainer for the long screw that runs vertically through the stock, holding the breech portion of the barrel securely in place. The screw that holds this in place is known as the tang screw, which commonly fastens to the trigger assembly and helps hold it in place.

Thimble—The metal ferrules located along the ramrod channel or under the barrel. It is for storing and carrying the ramrod.

Vent—The small hole running from nipple to breech plug on caplocks, through which the priming flame travels to ignite the powder charge.

Worm—A corkscrew-type device used to remove a shotgun wad or a cleaning patch stuck in the bore of a muzzleloading rifle; screws into the threaded tip of a cleaning rod.

Loading Procedures

1. Determine that the nipple vent of the flashhold is clear, then place the hammer at half-cock.
2. Fill the powder measure from a horn or flask.
3. Using the measure, pour the charge into the bore.
4. Position patching material over the muzzle and seat the ball—flat side up—using the short starter.
5. Trim the patch flush with the muzzle.
6. Use a long starter and a single blow from your hand to start the ball down the bore.
7. Use the ramrod and steady pressure to firmly seat the ball against the powder charge. Leave no air space.
8. Place the cap on the nipple, applying pressure to seat it firmly.
9. In priming the flintlock, charge the flash pan with FFFFg powder.

Remember: Powder, patch, and ball, or it won't shoot at all!

Publication 1563 (POD-04-20)

Prepared by the National 4-H Shooting Sports Development Committee. Distributed in Mississippi by the Mississippi State University Extension 4-H Youth Development Program.

Produced by Agricultural Communications.

Extension Service of Mississippi State University, cooperating with U.S. Department of Agriculture. Published in furtherance of Acts of Congress, May 8 and June 30, 1914. GARY B. JACKSON, Director