



**NATIONAL PARK SERVICE
MANUAL
FOR THE HANDLING AND FIRING OF
18TH CENTURY SWIVEL GUNS IN
INTERPRETIVE DEMONSTRATIONS**

(Revised March 14, 2016, B. Reedy)

INTRODUCTION

This manual sets forth the procedures that must be followed by persons demonstrating the 18th century swivel gun three- (3) man drill (4 with interpreter) in areas administered to the public by the National Park Service. It also provides instruction on proper maintenance, inspection and repair procedures. This manual draws heavily on the already established NPS 18th century field artillery guideline in wide use throughout the system.

NPS employees Bill DeBerry, Eric Williams, Don Long and Timothy Boyd revised this NPS manual. The credit for laying the foundation for the original manual needs to be given to former NPS historians, William Meuse and Jack Dugan who both have extensive backgrounds and years of experience in the subject matter. Their many hours spent on the original publication are greatly appreciated. Credit should also be given to Mike Williams who provided a preliminary version of a swivel gun drill.

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INTRODUCTION

TO THE SWIVEL GUN

A number of various gun drills existed during the 18th century, some of which are rather complex and others relatively simple. The British drill is perhaps the most interesting, but it requires a crew of fifteen or sixteen men to serve a field piece—an impressive demonstration to be sure, but one hardly possible with current staffing in the parks. Known French drills of the period appear to be based on the use of Gribeauval equipment and carriages, which would not be overly practical with the types of reproduction ordnance being produced. And the German drills of the period, while truly spectacular are downright dangerous, as the Germans did not believe in sponging the piece between rounds.

The only known American drill of the period was first set forth in print in a work entitled A System of Discipline of the Artillery of the United States of America, written by Wm. Stevens and published in 1797. William Stevens was a veteran artillerist of the Revolution and had served with distinction at Yorktown. Following the war, he was asked to prepare a manual for the use of the new American artillery, and he quite naturally drew from experience. The drill he sets forth is basically a modified form of the British drill—a drill most Americans were familiar with from before the war.

The iron or brass swivel gun was in wide use throughout the American colonial period and the Revolutionary war. They were particularly effective defending frontier forts against attack. Larger guns were needed to lay formal siege to a fort, but for close range, anti personnel use the swivel gun was ideal. Being a small stationary cannon, with only a 1 ½ - 3 inch bore, it was simple to load and fire. Apparently there was no formal drill for firing the swivel gun, and just two or three men could serve it.

The modified Stevens drill reduces the size of the field artillery crew from sixteen to six, and this has done well with the larger field artillery cannons. The swivel gun is small in size, with a six-man gun crew firing the weapon could be dangerous. Using a three-man crew, modified Stevens drill, written in simplified English, the three-man crew would have better control of the weapon.

In the interest of safety in firing demonstrations of the swivel gun, the modified Stevens drill for field artillery and a three-man gun crew adapts nicely with the swivel gun. The following pages contain the commands for the drill, their respective movements, and special notes (*Italics*) on safety and interpretation.

IMPLEMENTS AND EQUIPMENT

The following list of implements and equipment are considered to be the minimum levels for conducting safe demonstrations:

<u>Implement/Equipment</u>	<u>Minimum Recommended No.</u>	<u>Material</u>
Sponge/Rammer	1	Stave, Ash or Hardwood
Sponge-Head		Elm, Poplar
Rammer-head		Ash or Elm
Worm	1	Stave, Ash or hardwood
Sponges	Replace as necessary	Wool carpet or Sheepskin
Sponge Bucket	1	Iron or Wood
Priming Pouch	2	Leather
Thumbstall	2	Leather
Priming Wire	2	Brass
Haversack	1	Leather or canvas
Lintstock	1	Stave, Hardwood
Leather Gauntlets	1 pair	Heavy leather

The sponge-head and rammer-head are attached to the stave by means of hardwood dowels. Nails, used to attach the copper band on the rammer-head and the sponge to the sponge-head, are of copper or brass.

NOMENCLATURE OF CANNON

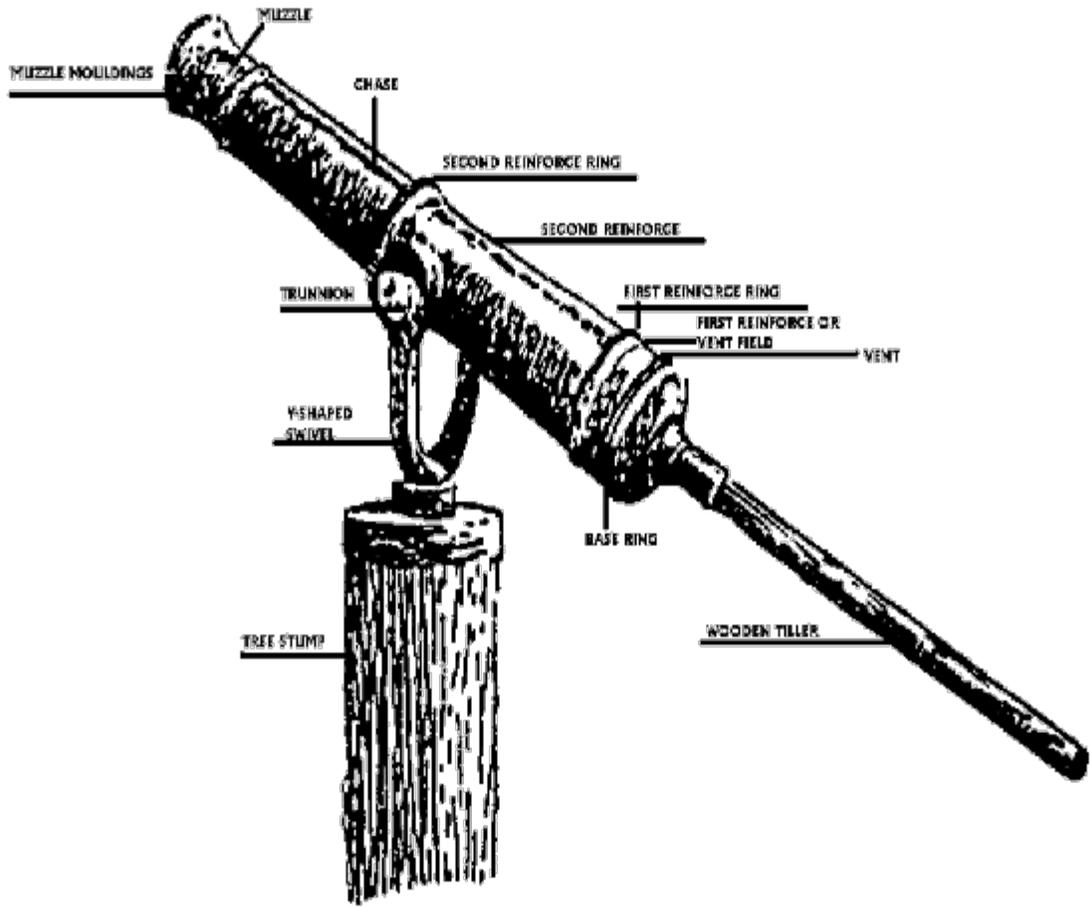
Utility was more important than firepower. With no mount but the Y-shaped swivel, swivel cannon, swivel guns, or just plain “swivels’ as they came to be called could instantly be turned in any direction. They could be swung around and pointed as fast as a man could aim a musket. Heavy field artillery had its place, and different sizes had different functions; but wherever men needed mobility, light weight, and speed, the swivel gun became an all purpose weapon.

The basic design of the swivel gun was as small as 16 inches long with a 1.5 inch bore and often 23 inches long with a 2.9 inch bore.

Usual bore diameter and ball weights.

½	Pounder	– 1.5”	Diameter
¾	Pounder	– 1.75”	Diameter
1	Pounder	– 2.1”	Diameter
1 ½	Pounder	– 2.5”	Diameter
3	Pounder	– 2.9”	Diameter

**THE PARTS OF THE SWIVEL
GUN TUBE**



CARE AND MAINTENANCE

The Gun, Tiller, and Mounting Post

1. After each day's firings, the bore is thoroughly cleaned using fresh water. A mild, pure soap (i.e. Ivory) may be used to facilitate cleaning.
2. The vent and vent field is cleaned using fresh water and a soft bristle brush.
3. Vents were usually .2" in diameter. A vent in excess of .3" diameter should not be used. An extra vent piece should be purchased with the gun.
4. Use reproduction guns only; leave the originals in museums.
5. The **Gun Book** is kept up to date and notations on bore and vent diameters are updated at least annually.
6. Paint is to be renewed as necessary, steel liner in iron guns is secure.
7. It is recommended that cracks in the tiller be filled, since they allow water to seep into the wood.
8. The mounting post for most swivels should be made of a hardwood and resistant to insects and rot (i.e. cedar, cypress, locust, or treated wood).
9. Be especially aware of cracks and check in the mounting post since it receives the shock of the recoil.
10. A light oil or grease on the trunnions will allow the tube to be maneuvered more easily.
11. Since most swivel guns and yokes are easily removed from the mounting post and carried, taking them off at the end of the day's firings provides the best security.

Ammunition Chest

1. The chest should be properly made, having non-sparking materials on the inside. All nails are countersunk and the heads puttied over.
2. The lid should fit snugly and be provided with a lock. The chest is to be kept locked when not serving ammunition.
3. The chest is clean and free of spilled powder. All equipment's and ammunition is neatly and securely stored in the chest.

Implements and Equipment

1. Wooden implements should be free from serious cracks and splinters. Paint as necessary.
2. Rammer and sponge heads are securely fastened with hardwood dowels, and no sparking metals are used in the construction. (During off-season it is a good idea to soak the sponge head in boiled linseed oil to minimize deterioration.)
3. Leather equipment should be cleaned and kept free of dirt and loose powder. To preserve leather, neat's-foot oil, lexol or other commercial leather preservative may be applied to prevent drying and cracking.
4. Sponges are to be cleaned after daily firing with clean water and spun out to prevent matting. Since powder fouling deteriorates the fibers, sponges should be inspected frequently and replaced as necessary. In no case should a sponge be allowed to deteriorate to the point where there loose threads or rotting of the material.

PROPOSED NPS SWIVEL GUN DRILL

The proposed drill will incorporate very few changes to the modified Stevens drill already in use throughout the NPS. It seems logical that the established drill for 18th century artillery will work nicely with a few changes to accommodate the swivel gun.

-The established misfire drill procedures should suffice see appendix.

THE DRILL (Ft. Vancouver version)

Position # 1: Gun commander. Stands to the rear of the gun and controls the tiller at all times. Equipment: lintstock, slow match, tiller

Position # 2: To the right of the gun, looking downrange. Handles everything at the vent of the gun. Equipment: Quills, vent pick, thumb stall, loose powder cartridge

Position # 3: To the left of the gun looking downrange. Handles everything at the muzzle end of the gun. Equipment: Cartridge pouch, sponge / rammer, gauntlets, worm

1. **ATTENTION**, (atten...SHUN!), **FALL IN AT THE REAR OF THE PIECE!**
The crew will fall in at attention in a line behind the gun, facing away from it and dressing right to left. They will be fully uniformed and will have full equipment necessary for his duty.

This would be a good time for each position to take a step forward, identify their position on the crew, briefly state their duties, and explain particular bits of equipment, etc. While this is going on, the officer should make the last minute inspection of the crew, equipment, spectators, demonstration area, wind, etc. Crewmen fall-in the order shown to avoid confusion on the next command.

2. **MAN THE PIECE!** (Man the...PIECE!) The crew will execute a good crisp Von Steuben “right about face” and move out to their respective positions at the gun, assuming the position of attention and facing to the front.

1 (commander) will move to the left of the tiller and grasps the tiller with the **right** hand. Commander will maintain control of tiller throughout drill.

2 will take a position to the right of the piece, facing to the front, in line with the tripod mount, one pace from the piece.

3 will take a similar position to the left of the piece.



3. **SEARCH THE PIECE!** (Search the...PIECE) # 2 inserts pick into vent and shouts “CLEAR.” #3 holds the worm vertically in the left hand, and steps forward until he is at a convenient distance from the muzzle. At the same time he grasps the staff with the left hand near the end of the worm. The left hand should be with the backside down, palm up, and thumb pointing down range, away from the gun. # 3 will now enter the worm into the muzzle. The staff is pushed to the bottom of the bore using the left hand, still backside down on the staff. When it contacts the bottom of the bore, he turns the staff at least once in the proper direction to clean out any trash left in the bore and shouts “CLEAR.” # 3 withdraws staff from muzzle and places the worm in the rack and retrieves the sponge/rammer.



4. **ADVANCE SPONGE!** (Ad-vannnce...SPONGE!) # 3 is standing at attention one pace away from the swivel gun. He holds the rammer – sponge vertically in the right hand. Upon the command “Advance Sponge” he steps forward until he is at a convenient distance from the muzzle. At the same time he grasps the staff with the right hand near the sponge head and the left hand as far down the staff as is comfortable. The left hand should be with the backside down, palm up, and thumb pointing down range, away from the piece. This is important. Whenever sponging or ramming, the backside of the hand must be down! He holds the sponge poised near the muzzle or off to the near side of the muzzle face, but not in it. His body is to the side and behind the muzzle as much as possible.

The sponge head should be damp but not sopping. The sponge head is quickly dipped in the sponge bucket and the excess water is wrung out with the hand or by spinning the sponge head as it is held downward. Take care not to shake or splatter yourself and others.



5. **TEND VENT** (tend...VENT!) # 2 will sidestep to the left until he is beside the breech of the gun. He will place his left thumb hard on the touch hole so as to seal it completely from the passage of any air. The fingers should be extended just above the breech moldings, and the elbow elevated so as to exert maximum pressure. His body should be erect and square to the front. He must be wearing a Thumbstall. It should be soft and pliable enough to make an airtight seal. # 2 **WILL MAINTAIN THIS POSITION UNTIL THE GUN HAS BEEN SPONGED AND LOADED AND WILL MAINTAIN CONSTANT EYE-TO-EYE CONTACT WITH # 3 THROUGHOUT THAT PERIOD.** # 3's life may well depend on how carefully the vent is served. **THUMB NOT TO BE REMOVED FROM VENT UNTIL THE COMMAND "PRIME"!**

Alternatively the entire cascabel may be grasped with the thumb covering the vent and the fingers pressing upward from the bottom of the piece (as if holding a log). The officer and #3 should observe that the vent is indeed covered and pressure is being exerted. Care should be taken to select a position comfortable enough to maintain without shifting.



6. **SPONGE PIECE!** (sponge...PIECE!) #3 will now enter the sponge into the muzzle. He drops his right hand to his side. The sponge head is pushed to the bottom of the bore using the left hand, still backside down on the staff. When it contacts the bottom of the bore, he turns the sponge at least one and a half turns or more. More is better, and two or three full turns are to be preferred. The staff must be held with the backside of the left hand down, pressing the sponge against the breech face of bore. As soon as the sponge is entered into the bore, # 3 must establish eye-to-eye contact with # 2 who is tending the vent to make sure that he is alert and is tending to his duty. If he is not, # 3 must stop immediately and stand completely clear of the muzzle. While inserting the sponge down the bore, everyone listens for the telltale whistle or hiss of air that would indicate that the vent is not fully stopped. When sponging, only the left arm should be exposed in front of the muzzle, #3 draws the sponge out, again keeping the back of his left hand down. As the sponge clears the muzzle, he passes the sponge to his right hand.

Proper sponging of the gun has long been acknowledged as a key factor in avoiding accidents such as premature discharge. Good habits such as safe position palm up grip, etc. Needed for safe ramming are learned and reinforced during sponging.

- 1) *Getting to position...just where the feet are safely and comfortably placed in relation to the muzzle? Work on this with the greatest economy of motion. With practice, # 3 should step on the same "imaginary footsteps" every time. His final position at the muzzle should be safe. Comfortable and consistent suited for both sponging and ramming without shifting or adjustment.*
- 2) *Other items to note is the dampening of the sponge. It should not be so wet as to leave a pool of water in the bore, but damp enough for a good seal and to kill any possible sparks in the bore.*
- 3) *Bottom of the sponge completely in the bore. Here is where a sense of feel comes into play. You can't see inside but it can be felt. Let your hands be your eyes. Get to know the feel of the sponge head bottoming on a clean bore. Feel also for tight or dirty areas in the bore, rough spots or pitting, or the feel of old cartridge bag or debris. During practice place a mark (a piece of tape or narrow ring of paint is fine) on the sponge staff at the point where the head is bottomed. Use this for a visual check.*
- 4) *Train your ears also. Listen not only for that dangerous sound of leaking vent, but also for the sponge to bottom, or the sound it makes with debris. Listen for that "foomp" sound as the sponge is withdrawn from the muzzle. It tells you that the sponge has a good tight fit and that you had a good vent seal on the way out.*



7. **HANDLE CARTRIDGE!** (han-dle CARTRIDGE!) # 3 rest his tools on the tripod and moves smartly to the ammunition chest. Retrieves one charge and places it in the cartridge pouch. # 3 returns to the piece, passing # 1 and showing him the cartridge. Using his left hand takes out the cartridge from his cartridge pouch, which is slung on his left side. Show the commander the cartridge, so it can be seen that the cartridge is pointing in the right direction. **During this time the commander should make sure the lintstock and lighted slow match is held well away from the cartridge pouch!**

(Note: If a fourth person is available they should be designated the “powder monkey” and transport the cartridge from the ammo chest to # 3, following the above directions)

8. **CHARGE PIECE!** (charge...PIECE) # 3 will place the cartridge in the gun by cradling it in his left hand, back of hand down, entering it into the muzzle, and sliding it off his left hand with a quick thrust of the palm. A little practice will make this a smooth and continuous motion. # 3 is to take care that only his hands and arms are exposed in front of the gun. By sliding it in swiftly, the cartridge will enter the bore a distance, thus making it easier to seat the rammer.

Take special care not to place face and upper body overly close to the muzzle. With the smaller guns this is a common problem keeping the back straight and bending slightly at the knees helps to eliminate this. Enter only the charge and not your hand into the muzzle. Man # 1 continues to thumb vent. Man # 2 holds position with rammer poised.



9. **RAM DOWN – CARTRIDGE!** (ram down...CARTRIDGE!) # 3 will pick up the sponge rammer and insert the rammer head into the muzzle of the gun, let go of the rammer with his right hand which will drop to his side, and maintaining his underhand grasp on the staff with his left hand, ram the cartridge home. No need to move feet or shift position, but on some guns dropping the left slightly will help throw some weight into the stroke. Care should be taken to use the same force in seating the charge each time. # 3 must be sure to keep his body clear of the muzzle and keep his eye on # 2, to make sure he has the vent sealed. He must not **pound** on the cartridge, but seat it firmly with one long continuous stroke. As soon # 3, feels the cartridge seat fully, he withdraws the rammer and as the head of the rammer clears the muzzle, strikes it with the palm of his right hand. This helps flip the rammer around again so as to make ready for “advance sponge” and serves as a check to make sure the rammer head has not come off in the gun. He then resumes his original position at attention facing the front.

Several key points to keep in mind here. Safe body position rear of the muzzle, only one hand used and with the back down / palm up position, eye contact with man # 2, do not pound charge. # 2 maintains thumb on vent. # 3 must feel the charge firmly seat on the breech face. As with the sponge operation, a paint mark on the staff will serve to show where the standard cartridge is seated.



10. **PRIME!** (PRIME) On this command, and only on this command, # 2 will remove his thumb from the vent. He will take his priming wire in his right hand, insert it in the vent, prick open the cartridge and return the wire to the case. (will inform Commander, #1, if powder is felt) The priming wire should be handled much the same as a small arms ramrod. The hand should not be placed over the end of it or a finger placed through the loop. It should be held between the thumb and forefinger. He will then proceed to prime with either quill or loose powder. If a quill is used it should be handled in much the same fashion as the priming wire. After priming with loose powder man # 2 will stopper the horn and cup his left hand around (not over) the priming to protect from the wind.

*The officer does not command “prime” until man # 3 has resumed his original position. For reasons of authenticity, ease, and safety the use of the quill or tube primers are preferred. Use of a paper musket cartridge is preferred over the use of a horn for loose powder priming. If using a horn, the quantity of powder should be held to that required plus a re-prime. **Do not** roll loose powder with the horn as Stevens recommend! Just fill the vent and leave a small pile of loose powder on top and slightly toward the muzzle. The horn should be worn on the right side. It should be un-slung for use, otherwise there is a tendency to place the body over the vent. Make sure the stopper fits well and is in place when not in use. Treat the vent as a mini-muzzle and keep from being directly in line with it.*





11. **TAKE AIM!** (take...AIM!) The commanding officer (# 1) who is stationed to the left of the gun, will aim using the tiller. Since the swivel gun was essentially a close-range weapon, sighting is not as precise as with a larger field gun. #2 takes five steps to right away from muzzle, #3 five steps to left.

Aiming is a key point in shooting any arm and should be given due consideration. It is the job of man # 1 to aim the gun. Since the commanding officer is holding the lintstock and will be giving himself the command of fire, there should be no need of a visual signal of lowering a sword or his arm.

12. **MAKE-READY** (MAKE READY) # 1 (Commander) shouts this command out so the cannon crew and visitors know that the command of fire is next.
13. **FIRE!** (FIRE) # 1 (commander) is standing next the rear and left of the gun with tiller in his right hand and the smoldering lintstock in his left. # 1 is positioned a pace away from the swivel gun and is holding the tiller with his right hand, his right arm fully extended to give distance between himself and the vent. On the command of "Fire" # 1 swings the lintstock, which is in his left hand, in a graceful arc, and applies the glowing end to the priming. If gun fires #2 & #3 return to gun; #2 checks vent with pick and shouts "**Clear.**"



14. **SEARCH PIECE** – see # 3 above

15. **ADVANCE SPONGE** – see # 4 above

16. **TEND VENT** – see # 5 above

17. **SPONGE the PIECE** – see # 6 above followed by **PIECE SECURED**

All through the drill the commander (man # 1) is giving commands, maintaining control of the tiller, and tending his match, ensuring that it remains lit and glowing. He also minds the wind and keeps the lintstock away from # 3 and the cartridge as well as man # 2 and the priming. He must practice and learn to gauge his distance from the vent to eliminate the need to “fish around” with the slow match. He should endeavor to contact the priming from the muzzle side so that recoil carries the vent blast away from the match.

MISFIRE PROCEDURES

LEVEL ONE: The fire command is given and the priming just goes “zipp” and nothing happens. Don’t panic. This may just be a hang fire so everyone holds position and waits...three minutes after the last wisp of smoke is seen at the vent. In the meantime, buy some time with interpretation as uneasiness and indecision will quickly transmit itself to an audience.

After your wait, the officer has man # 2 remove the spent quill if one has been used, re-pick and prime with a new quill or loose powder. Man # 2 should wear a light glove.

The officer will give the command of take aim. He will then give the command of fire.

This should work in most cases. If not, on to the next step.

LEVEL TWO: A re-priming has not been effective. Do not re-prime again. All remain in position and wait at least three minutes have passed since the last wisp of smoke was seen at the vent. To begin: the interpretive program is now over and the audience should be dispersed; the commander maintains control of tiller; #2 or #3 take lintstock from officer while other individual gets the misfire kit.

1. With a syringe from the chest, three (3) full syringes of water are slowly introduced into the vent by one of the experienced crew members (wearing gauntlets) while commander maintains the tiller.
2. The commander then gently moves the tiller downward to bring the muzzle to full elevation. The pick is inserted into the vent and additional syringes of water are placed into the vent until it overflows.
3. The water is allowed to sit in the bore for at least 10 minutes.
4. The flooding device, a 3 ft. length of hose with an attached funnel is inserted into the bore by one individual who holds the funnel end while another person slowly empties a bucket of water into it.
5. The wad hook or worm is gently introduced into the bore, hooked into the charge and it is then withdrawn. It should then be placed in a bucket of water and pulled apart. The remains should be disposed of safely.
6. The gun should be thoroughly cleaned and the crew may be dismissed.

MUZZLE-LOADING CANNON INSPECTION CHECKLIST

- Your overall impression is favorable

The Tube:

- The tube is clean and free of dust and corrosion.
- No sign of external damage or strain (dents, cracks, etc.)
- Inside of the bore is clean and relatively smooth.
- No internal signs of damage (bulges, lodgments, pits, etc.)
- No sign of corrosion damage at breech of the bore.
- On iron guns with liners, the liner is secure.
- The vent is clear and of acceptable size.
- No signs of cracks or bending around the trunnions.
- No signs of weakness at the chaplets on bronze tubes.

The Yoke:

- The yoke is mounted securely on the post.
- The yoke accommodates the tube easily (i.e. the trunnion fit securely, yet allow the tube to swivel with ease.)
- No signs of cracks or bending in any portion of the yoke.

The Post:

- The post is mounted securely in the ground.
- There are no signs of deterioration (rot, insect damage) which would cause an unsafe demonstration.
- No serious cracks which would make the demonstration unsafe.
- Deep cracks have been repaired.

Equipment:

- All necessary equipment is present.
- Sponge is in good condition and fitted to the bore.
- Rammer head is secure and free of cracks.
- Small items in good condition (lintstock, thumb stall, buckets, etc.)
- Prongs of the worm are sharp and not bent.
- Haversack is clean and free of spilled powder.
- The gun book is being kept up to date.

SWIVEL GUN DEMONSTRATION CHECKLIST

Before:

- () The gun has been inspected, inside and out. Bore is clean of foreign material.
- () The accessory equipment is in good condition—sponge head is in good repair, rammer and sponge head secure on staff, etc.
- () Sponge head fits bore snugly, but not too tight.
- () Ammunition boxes, haversacks, etc., are clean and free of spilled powder.
- () Ammunition is properly prepared, with just enough on hand for one demonstration.
- () The equipment is on hand to handle a misfire.
- () The required number of personnel is present to fire the piece.
- () The gun is situated safely in relation to visitors. Note: 60 yards to the front.
- () There is good visibility by the visitors so there will be no jostling and pushing to see and hear.
- () The interpreter can see all of the visitors and also see downrange.
- () Visitors are properly contained at the NPS required safe distance. Note: 12 yards from piece.
- () The ammunition box is at the NPS required safe distance from the piece as well from visitors. Note: 10 yards from piece and 7 yards from visitors.
- () The wind is not too strong for a safe demonstration.
- () Conditions are not so dry as to risk a range fire from the muzzle blast.
- Equipment is available should one develop.
- () There is a first aid kit and emergency communications system available.
- () There are no open fires nearby—campfires, etc.

During:

- () The crew is following the approved manual with each person where he is supposed to be at any given moment.
- () The sponge is adequately damp but not soaking wet.
- () The man ramming is holding the rammer properly and the vent is being properly tended at the same time.
- () The rammer man is wearing gauntlets, but they are not so stiff and heavy as to cause fumbling or other difficulty.
- () The sponge head does not contact the ground at any time during demonstration to prevent grass, sand, etc. from sticking to it.
- () If there is a misfire, it is handled safely and properly.

After:

- () After firing, the piece is wormed and then washed out and dried.
- () All weapons, explosives and accessory pieces are accounted for.
- () The weapon is secured and stored properly.
- () The demonstration area is inspected carefully for smoldering residue.
- () Sponge head is thoroughly rinsed out and dried.
- () All remaining explosives are promptly returned to proper storage area.

APPENDIX

GENERAL SAFETY INFORMATION

Of the dozen or so serious artillery accidents which have taken place in recent years, it has been noted that none have occurred on the first shot. Each has been on the second or succeeding shot. It therefore follows that the safety margin will greatly enhanced if firing demonstrations can be limited to a **single** round. Of those accidents which have been investigated thoroughly, it has also been noted that one of two factors or a combination of the two has caused them all. Either the crews are not using ammunition that was intended for the weapon, or they are not following the manual prepared for that weapon. In some cases of serious injury, the numbers of people injured would have been reduced had the crew been following the manual and been in the positions designated.

Regarding the ammunition, it should suffice to say that muzzle-loading artillery was designated for the use of coarse black powder, and nothing else. Attempts to mix other ingredients with the black powder (flash powder, smokeless, railroad torpedoes, etc.) have frequently resulted in accidents or burst guns. The black powder should be of Fg granulation or preferably coarser, although at the present time Fg is about the coarsest commercially available. The charge should be contained in an aluminum foil cartridge during the 18th century, so there is historical precedence for it. The charge itself should be a modest one and should never exceed the maximum load as listed in NPS-6. However, the cartridge should be long enough so it won't "turn" in the bore. A "ball" of loose foil inside the cartridge will accomplish this and also provide some "wadding".

Loose powder should never be allowed anywhere near the weapon, the public or demonstration area. Deaths and injuries have resulted in recent years from the ignition of bulk powder in the demonstration area.

The priming of 18th century ordnance can be accomplished in one of two ways – either by a small quantity of loose powder or by using a quill primer. If using loose powder, carry a small quantity of it in a stoppered powder horn. Do not fill the horn to capacity – carry only as much as you will need, plus a

bit more to cover the eventuality of a misfire which would require a re-priming. A recent accident happened when a gunner re-primed a piece that had misfired, and as he was pouring from the horn, the piece discharged and the horn exploded. Only the fact that he had a small quantity of powder in the horn saved him from serious injury. Therefore, be careful in re-priming to be sure the piece has truly misfired and is not just hang-fire. Do not keep your horn full, and make sure it is stoppered when not actually in use.

Quill primers are easy to make, a bit safer, and more effective. Take a small size paper soda straw – the size commonly used for soft drinks (although they can be difficult to find), twist off one end, and fill it with powder. A finer grain of powder will do nicely here – FFG or even FFFg. Tap it down and seat it fully, then twist off the top end. It will resemble the original quill primer, and it will fit perfectly in a vent of regulation diameter. To use, the cartridge is pierced with the vent pick, the end torn off the “quill,” and the open end inserted in the vent. It is then pressed down until it enters the cartridge. Then the upper end is torn off to expose the powder, about an inch above the surface of the gun tube.

Ignition of the priming is accomplished through the use of a portfire or a lintstock. A portfire was virtually identical to a present – day railroad or safety flare, and a bit dangerous. Lintstocks are preferred. The lintstock is a wooden staff, which is, wound a length of cotton cord treated with potassium nitrate. Old clothesline is good for this, just make sure it has no wire or plastic core – and soak it in a heavy solution of potassium nitrate and water. New clothesline has to be washed several times to remove the sizing before it can be used.

Now, let us turn our attention to the manual. If the proposed drill contained in this manual is followed by a crew that has developed a degree of proficiency, that chance for mishap will be minimal. Cannon accidents are of several types, the most dangerous being a premature discharge when the gun will discharge “by itself” during the loading. Quite frankly, if a piece discharges during loading, there’s really not too much that can be done for the man with the rammer. If he keeps his body clear of the muzzle and maintains an underhanded grip on the rammer, the damage will be confined to the one arm. The wearing of heavy gauntlets is encouraged, provided they are not so stiff as to cause the man to fumble. Again, it should be noted that we are unaware of any premature discharges occurring on a first round – they have always been on second or succeeding rounds and caused by faulty sponging, heat build-up or un-extinguished sparks in the vent or elsewhere. If the crewmembers are where they are supposed to be during the loading and a premature discharge does occur, there is no reason any of the other crewmembers would be injured. It is only when the manual is violated that additional injuries occur. The foregoing is not intended solely to scare people

– it is merely an honest statement of the risks. The crew must work closely together as a team. What one man does – or does not do – may well affect the safety of the others. People who understood muzzle-loading artillery far better than we do – they lived with it every day-wrote the various 18th century manuals. They developed a system they considered best, and it is to our advantage to avail ourselves of their experience and to follow their procedures.

SAFETY SUMMARY

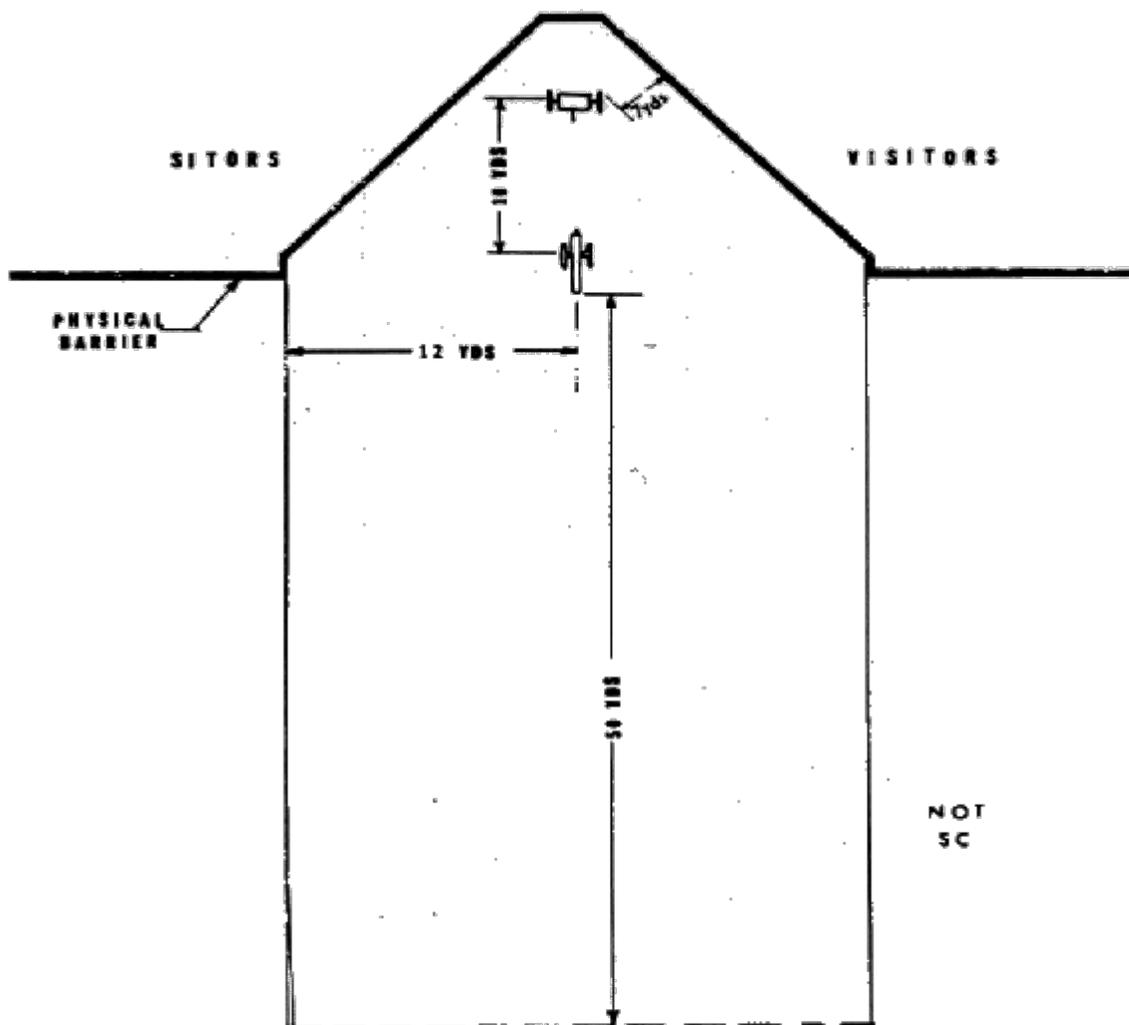
- 1) Make sure your sponge head is in good condition and always damp.
- 2) Do not let the sponge head contact the ground, it can pick up dirt, sand or grass that can find its way into the gun. When not in use keep a canvas cover over it.
- 3) Keep your haversack for cartridges clean. Turn it inside out and dump it at the end of every drill.
- 4) Conduct your firing demonstrations away from open campfires, etc. No smoking around the gun or ammunition box.
- 5) Be aware of any wind that is blowing and the direction it may carry sparks or fragments. This is especially critical when using a lintstock.
- 6) In dry weather, the muzzle blast of a cannon will frequently set fire to dry grass or leaves in front of the gun. Be prepared, have fire-fighting equipment handy.
- 7) Check the bore frequently and draw out any unburned powder bag bottoms with the wad hook or worm. Inspect with a flashlight or mirror. They can build up and block the vent.
- 8) The cartridge should be enough undersized to slide into the bore easily and be seated without pounding. It should not be so small however that it will not fill out when seated or require inordinate priming.
- 9) Be sure the rammer head, sponge head, and sponge cover are well secured so that they don't come off in the gun. A flying rammer head can be dangerous missile.
- 10) A little vinegar mixed with the sponge water will help keep the powder fouling down.
- 11) Make sure the post on which the swivel gun is mounted is secure. Check the yoke, ensuring that there is a tight fit, yet allowing the cannon to move easily vertically and horizontally.
- 12) Check the tiller to make sure it is solid (preferably a hardwood) and that any cracks or splits are repaired.

- 13) As crews develop proficiency, they also develop the desire to show off, take short cuts, rapid fire, etc. Control that impulse. 18th century crews may have been able to fire 16 or more rounds a minute but life was a bit cheaper then too.
- 14) Inspect the gun. Use your checklist frequently. The public likes to put strange objects in tubes. Before each program, use your flashlight, wadhook, and sponge.
- 15) Clean your gun, scrub it out with soapy water at the end of the day. Lubricate regularly.
- 16) Maintain your equipment...check for wear, breakage, looseness, etc.
- 17) Make sure to return all unused cartridges, priming powder, and tubes to the magazine at the end of the day.
- 18) Wash out your sponge at day's end or powder fouling will eat it up in no time. Baby shampoo works well.
- 19) Don't forget to clean the vent. A .22 bore brush works fine. Follow up with a few Q-tips.

MAXIMUM TABLE OF LOADS

½	Pounder – 1.5”	Diameter	2	Ounces
¾	Pounder – 1.75”	Diameter	2 ¼	Ounces
1	Pounder – 2.1”	Diameter	2 ½	Ounces
1 ½	Pounder – 2.5”	Diameter	2 ¾	Ounces
3	Pounder – 2.9”	Diameter	3	Ounces

RANGE FOR BLANK CANNON FIRING



RANGE FOR BLANK CANNON FIRING

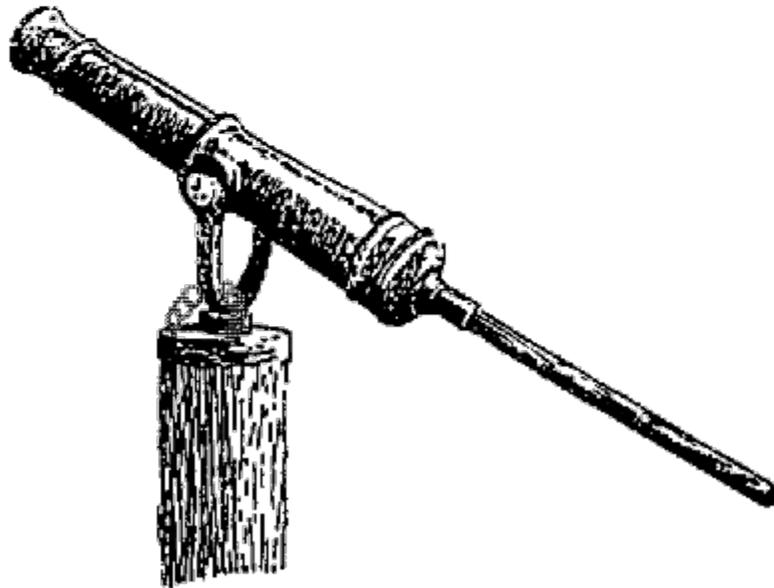
SECURING THE SWIVEL GUN FOR VISITOR PROTECTION

The Swivel Gun should be restricted from left to right movement to keep it from accidentally being bumped and firing on the visitors during the demonstration.

The restriction movement can be accomplished two different ways.

1. A chain can be anchored into the tree stump on both sides of the swivel. This would restrict movement of the swivel gun from going passed the right or left visitor barrier.
2. An iron flat bar “hammered into shape” and two holes drilled at each end of the bar so it can be anchored into the tree stump. You will need to measure the top of the stump, over the swivel and the other side of the stump to know how long the bar should be.

NOTE: See illustration below on how to secure the Swivel Gun using the chain.



SUGGESTED READING LIST OF READILY AVAILABLE TITLES

Birkhimer, Wm. E. **Historical Sketch of the Artillery of the United States**, Washington, 1884. Reprinted in 1968 by Greenwood Press, New York.

Foulkes, Charles, **The Gun Founders of England**, Cambridge, 1937. This has recently been reprinted.

Gooding, S. James, **An Introduction to British Artillery in North America**, Ottawa, 1965.

Hughes, B.P., **British Smooth-Bore Artillery**, Harrisburg, 1969

Manucy, Albert, **Artillery Through the Ages**, Washington, 1949

Muller, John, **Treatise of Artillery**, London, 1757. Reprinted 1965, by Museum Restoration Service, Ottawa.

Peterson, Harold L., **Round Shot and Rammers**, Harrisburg, 1969.

Rudyard, Wm., **Course of Artillery at the Royal Military Academy**, 1793
Museum Restoration Service, Ottawa.

Smith, George, **A Universal Military Dictionary**, London, 1779. Reprinted 1968, by Museum Restoration Service.

Stevens, Wm. A., **A System for the Discipline of the Artillery of the United States of America**, New York, 1797. This has not been reprinted, but numerous photocopies exist in the National Park System.

Tousard, Louis De, **American Artillerist's Companion**, Philadelphia, 1809 – 1813. Reprinted 1969 by Greenwood Press, New York.

Wilkinson-Latham, Robt., **British Artillery on Land and Sea**, 1790 – 1820, Devon, 1973.