ROYAL CANADIAN AIR CADETS

PROFICIENCY LEVEL FOUR

INSTRUCTIONAL GUIDE

SECTION 9

EO C490.04 – PRACTICE SAFE TOOLCRAFT

Total Time: 90 min

PREPARATION

PRE-LESSON INSTRUCTIONS

Resources needed for the delivery of this lesson are listed in the lesson specification located in A-CR-CCP-804/PG-001, *Proficiency Level Four Qualification Standard and Plan*, Chapter 4. Specific uses for said resources are identified throughout the instructional guide within the TP for which they are required.

Review the lesson content and become familiar with the material prior to delivering the lesson.

PRE-LESSON ASSIGNMENT

Nil.

APPROACH

A demonstration and performance was chosen for this lesson as it allows the instructor to explain and demonstrate the skills. The cadets are expected to sharpen a knife and an axe, and to cut wood while providing an opportunity for the cadets to practice the skills under supervision.

INTRODUCTION

REVIEW

Nil.

OBJECTIVES

By the end of this lesson the cadet shall be expected to practice safe toolcraft.

IMPORTANCE

It is important for the cadets to be able to safely use tools on an aircrew survival exercise. Tools support aircrew survival training by assisting the cadets in setting up an aircrew survival exercise site, erecting tents and starting fires. The cadets need to know how to safely use tools to prevent accidents.

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Teaching point 1 **Explain, demonstrate and have the cadets handle, pass and store tools.**

Time: 25 min Method: Demonstration and Performance

For this skill lesson it is recommended that the instruction take the following format:

(1) Explain and demonstrate handling, passing and storing tools while the cadets observe.

(2) Explain and demonstrate each step required to complete each skill. Monitor the cadets as they imitate each step.

(3) Monitor the cadets' performance as they practice the complete skill.

Note: Assistant instructors may be used to monitor the cadets' performance.

HANDLING TOOLS

All tools need to be handled with great care and control. For this lesson, focus on the safe handling and passing of a knife, an axe and a bow saw, since these tools are most dangerous when used incorrectly.

These safety considerations should transfer to all other tools that are used during an aircrew survival training exercise.

AXE

A blade cover protects the user from injury, the cutting edge from damage and should be used if available. Always carry an axe by its head. Place two fingers on one side, and grip the neck with the other fingers and thumb on the other side. The handle should point horizontally to the ground and the blade should face outward.



Note. Created by Director Cadets 3, 2009 Ottawa, ON: Department of National Defence.

Figure 1 Axe

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Bow Saw

A bow saw has a sharp long blade that should be covered when carrying for long distances. When the bow saw is carried short distances, the carrier should be aware of where the blade is at all times. Keep the blade facing away from the body and hold the handle firmly. It can be carried in hand, with the blade facing down.



Note. Created by Director Cadets 3, 2009 Ottawa, ON: Department of National Defence.

Figure 2 Bow Saw

Shovel

The shovel is to be handled at the upper part of the shaft toward the shoulder when carrying. The shovel blade should be facing the ground with the cutting edge pointing downward.



Note. Created by Director Cadets 3, 2009 Ottawa, ON: Department of National Defence.

Figure 3 Spade Shovel

Knives

Using a knife improperly can cause injuries and damage the knife. It is important to remember what the knife is designed to do. It is not designed to pry. This may damage the tip of the blade. The handle or butt is not a hammer.

A dull knife requires more energy to use and the increases the risk of injury.

A knife can assist greatly during a survival situation but it is useless if it is broken by using it as a substitute for another tool.

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When handling a knife, practice the following principles:

- Always cut away from the body or limbs, never toward.
- If the knife is dropped, let it fall to the ground as trying to catch it may cause serious injury.
- Never point a knife at anybody.
- If the knife is a fixed blade, always return it to the sheath when not in use.
- If the knife is of the folding variety, keep it folded away when not in use or keep it in a sheath.
- Never walk or run around with an open or unsheathed knife.

Ensure the knife is only used when the user can clearly see what they are doing. Use adequate lighting after dark.



Note. From "Military Pictures", Gerber Infantry Survival Knife, Retrieved April 28, 2009, from http://www.militarypictures.info/weapons/gerber.jpg.html

Figure 4 Survival Knife

PASSING TOOLS

When passing tools that have a sharp edge, adhere to the following steps:

1. The passer communicates the intent to pass the tool.
2. The receiver gives both a verbal response and eye contact that they accept.
3. The passer and the receiver stand facing each other.
4. The passer holds out the tool with both hands and the sharp edge down.
5. The passer waits for the recipient to place both hands on the tool.
6. The passer asks the recipient if they have control.
7. The recipient states that they have control.
8. The passer releases control of the tool.



These steps may seem overstated, but most accidents that occur when passing tools are a result of poor communication. It takes very little force for a sharp tool to severely injure.

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STORING TOOLS

When storing tools, adhere to the following:

- Always clean tools before storing.
- Check tools frequently to ensure they are in operating condition.
- Always choose a tree close to the aircrew survival site to store tools or build a tool shelter.
- Store tools in a common area that is clearly identifiable.
- Mask or store axes and bow saws in a secure case when not in use (as illustrated in Figure 6)
- Keep all tools away from rain, snow and dirt.
- Do not leave an axe or a bow saw embedded in a stump as the sap causes the blade or bit to rust.
- Do not leave tools lying on the ground.
- Tools should not be stored against a tree even for a brief time.
- The user is responsible for the tool from the time it is taken from its case or storage area until it is returned.



Note. From Scoutmaster, Knots and Pioneering, Copyright 2007 by Amazon.com, Inc. Retrieved November 18, 2007, from http://scoutmaster.typepad.com/.shared/image.html?/photos/uncategorized/chip5_copy_copy.jpg

Figure 5 Tool Rack

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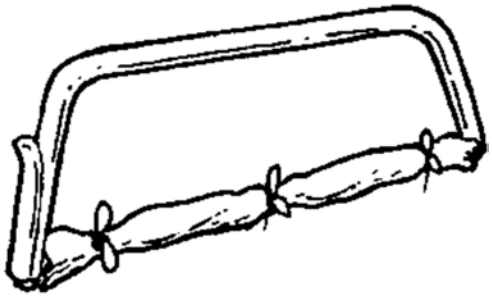

Note From "Use of Axes and Saws", Copyright 2005 by ScoutBase UK. Retrieved April 28, 2009, from http://www.scoutbase.org.uk/library/hqdocs/facts/pdfs/fs315070.pdf

Figure 6 Storing a Bow Saw

CONFIRMATION OF TEACHING POINT 1

The cadets' participation in handling an axe, a bow saw, a shovel and a knife, and safely passing and storing tools will serve as the confirmation of this TP.

Teaching point 2 **Explain, demonstrate and have the cadets clean and sharpen a knife and file and sharpen an axe.**

Time: 20 min Method: Demonstration and Performance



For this skill lesson it is recommended that the instruction take the following format:

(1) Explain and demonstrate cleaning and sharpening a knife and an axe while the cadets observe.

(2) Explain and demonstrate each step required to complete the skill. Monitor the cadets as they imitate each step.

(3) Monitor the cadets' performance as they practice the complete skill.

Note: Assistant instructors may be used to monitor the cadets' performance.

KNIVES



To preserve the life of a knife, only use it for its intended purpose. Do not to use blades to pry things, punch holes, as a hammer, or as a screwdriver.

CLEANING

To clean a folding knife, open the blade and rinse with warm soapy water and dry well. It may be helpful to scrub it with an old toothbrush. Be careful when handling the knife while the blade is open.

When the knife is completely dry, lightly oil it with machine oil (or cooking oil if the knife is used for food). Wipe off any excess oil and close the blades.

It is important to keep the edge of a knife blade sharp, as a dull knife can be more dangerous than a sharp one. Do not exert too much pressure or use force to make a blade cut through something. By keeping the knife clean, dry and lightly oiled, it will not require sharpening as often.

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When sharpening a knife it is important to keep it secure, maintain a uniform sharpening angle on both sides and be careful of cutting fingers. A sharpening stone is most practical for sharpening a knife.

Sharpening Using a Sharpening Stone and a Honing Stone

Sharpen a knife as soon as it becomes dull. Use a quality sharpening stone and apply lubricant as specified for the stone. To reshape an edge use a 400 grit sharpening stone. A 1 000 grit sharpening stone and above will sharpen the edge. A honing stone is used to polish the cutting edge and is usually above 2 000 grit. To polish a blade that has stains on it, use wood ash as it will not scratch the blade. Use the following steps when sharpening a knife with a sharpening stone:

1. Apply a light coating of oil (if it is a whetstone or oil stone) to the stone to lubricate and protect the surface. The oil helps keep bits of stone and steel—called slurry—on the surface of the stone. The slurry helps the cutting action of the stone. Ceramic and diamond stones can be used dry or wetted with water.

2. If a combination stone is being used, start with the coarsest grit side.



A hollow ground blade will be sharpened only at the cutting edge at a combined angle 20–30 degrees.

3. To sharpen a hollow ground blade hold the knife with the back edge of the knife off the sharpening stone at 10–15 degrees.

4. To sharpen a flat ground blade, place the bevel flat on the stone. This will register the blade at the proper angle for sharpening.

5. Start where the blade meets the handle and draw the full length of the blade across the stone while moving the blade from one end of the stone to the other. Apply steady pressure. Repeat this eight times on each side.

6. Repeat the process using the fine side of the sharpening stone.

7. Using a honing stone and honing oil, hone the blade, alternate each stroke with the opposite side of the blade for eight strokes maintaining the same angle as before.

8. If a wire edge forms—a thin wire of steel at the very edge of the blade—repeat the same motion on a piece of card board or honing stone until the wire edge falls off.

9. Test for sharpness by cutting something or by looking at the edge of the blade for reflections from unsharpened areas, not by drawing the fingers across the blade.

10. Clean and dry the stone following the manufacturers' instructions.

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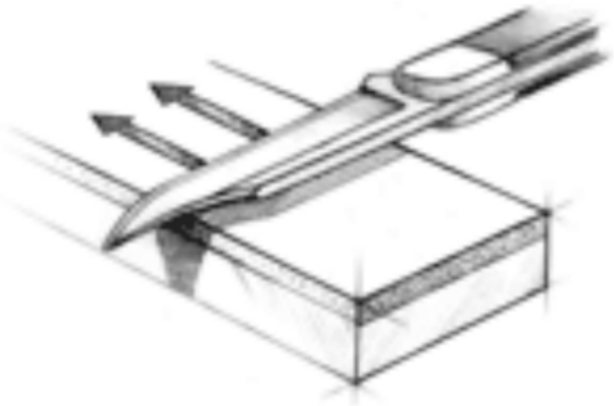

Note. From Chesapeakeknifeandcutley.com, Copyright 2007 by PAX River Enterprises. Retrieved November 19, 2007, from http://www.chesapeakeknifeandcutlery.com/index.asp?PageAction=Custom&ID=49

Figure 7 A Sharpening Stone

AXES

If the axe's cutting edge is chipped or misshaped from repeated honing, filing will be necessary. If the edge has the proper profile but is dull, honing is all that is required.

Filing an Axe Head

Placing the axe in a vice or clamp it securely to a work surface. Facing the axe head, hold the handle of the file with the right hand and the tip of the file with the left hand. Reverse if left handed. Thick leather gloves are recommended for this procedure. File towards the edge at a 10-degree angle, moving from the top of the blade to the bottom. The file must bite only in the push movement and not to touch the axe when returning to the start position. Only remove enough material to shape the cutting edge. Once a side is done then turn the blade over in the vice and repeat the process.



Note. From "U.S. Department of Transportation Federal Highway Administration", 2004, An Axe to Grind: A Practical Ax Manual,

Figure 8 Filing an Axe

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Sharpening Using a Sharpening Stone and Honing Stone

With the axe in the vice, sharpen the edge using a sharpening stone. Use a circular motion starting from the top of the blade to the bottom. Make sure the stone remains in contact with the blade at the proper angle of 20 degrees. Finish sharpening with a honing stone and honing oil to polish the edge, using the same circular motion as with the sharpening stone.



The best way to keep an axe sharp is to use and store it properly. Do not stick it in the dirt or leave it in a tree. Always clean it after each use and apply oil to the blade. Always keep the original shape of the bit and the bevel. An axe that is given the wrong shape and bevel can bounce off the wood uncontrolled.

CONFIRMATION OF TEACHING POINT 2

The cadets' cleaning and sharpening of a knife and filing and sharpening an axe will serve as confirmation of this TP.

Teaching point 3 **Explain, demonstrate and have the cadets cut wood.**

Time: 20 min Method: Demonstration and Performance



For this skill lesson, it is recommended that instruction take the following format:

(1) Explain and demonstrate how to cut wood using tools skill while cadets observe.

(2) Explain and demonstrate each step required to complete the skill. Monitor cadets as they imitate each step.

(3) Monitor the cadets' performance as they practice the complete skill.

Note: Assistant instructors may be employed to monitor the cadets' performance.

SAFE WOOD CUTTING

An axe and a saw can be dangerous tools if mishandled. If the tools are in a poor condition—either dull, rusted or damaged—they should not be used. Using cutting tools requires proper attitude and concentration. Avoid using tools when tired or angry. Always be conscious of where the blade is.

CLOTHING

Avoid loose clothing, scarves or anything that may become entangled with the tool. Thick leather boots with steel toes are recommended.

SITE

The site should be clear of ground obstructions and people. Overhanging branches should be trimmed away from the cutting site. Ensure all people know that wood is being cut and that they stay 10 m back. An axe held at arms length will indicate the minimum area that should be cleared for chopping. Cordon off the area used for chopping.

Inspect the axe before use. Do not use an axe if the head and handle do not line up straight, if the handle is split, chipped or otherwise damaged or broken, or if the head is loose. Never use a blunt axe as it can slip or bounce off wood uncontrolled.

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Splitting Wood

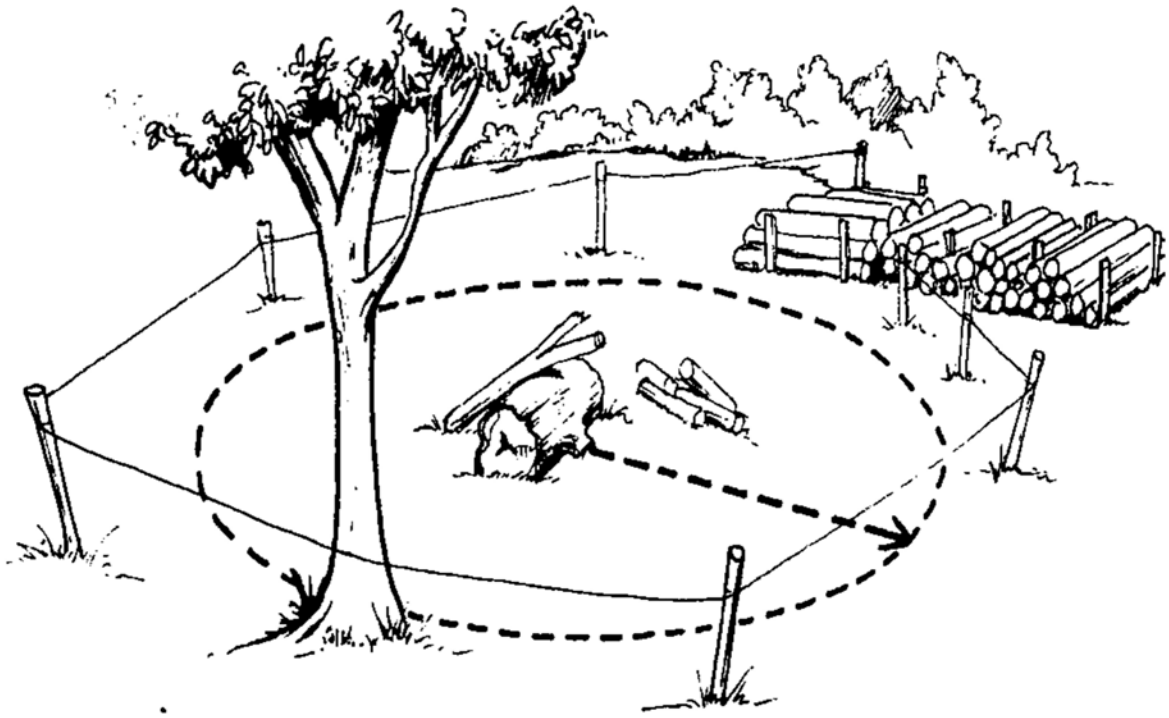
Always use a chopping block below the wood to be chopped and do not let the axe go into the ground. The chopping block should be the largest round available and placed upright so the top surface is level and parallel to the ground.

Chop directly over the chopping block. The part to be cut should be resting at the centre of the chopping block and standing on its own.

Always stop when feeling tired, because there is a greater chance of missing and causing a serious injury.

Use an axe within a marked out chopping area. A bow saw is a safer tool to use away from the chopping area.

The chopping area is out of bounds for anyone not properly clothed or trained.



Note. From Scoutingresources.org/camping, Copyright 2007 by Scouting Resources. Retrieved November 19, 2007, from http://www.scoutingresources.org.uk/camping_axe.html

Figure 9 Chopping Area

USING AN AXE

On a Chopping Block



Before starting to use an axe, ensure that there is no one in the chopping area.

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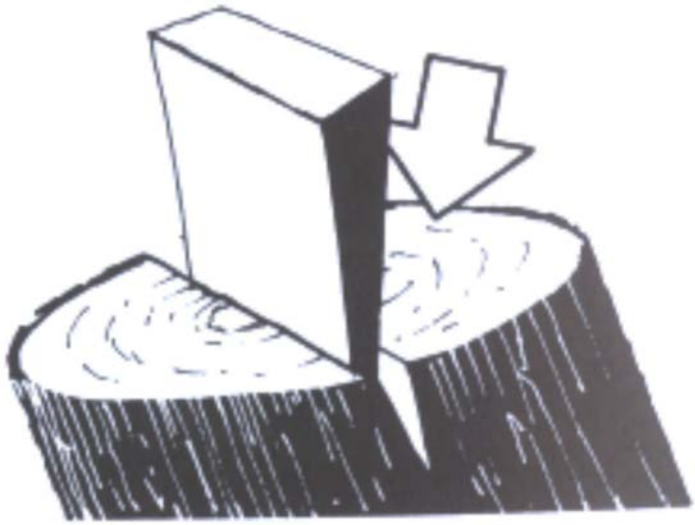
To chop wood with an axe:

1. Place a round of wood on the chopping block on its widest end, aligning the round so no knots face the person chopping.

2. Stand facing the chopping, legs spread shoulder width apart, the axe head centred on the chopping block at arms length.

3. Raise the axe above the head and bring it down onto the round. Let the momentum of the swing and weight of the axe do the work. To verify the distance from the block is correct, check the swing by chopping into the chopping block. Adjust the position as necessary.

To split larger logs, use a wedge and a mallet (as illustrated in Figure 15).



Note. From The SAS Survival Handbook (p. 306), by J. Wiseman, 1999, Hammersmith, London: HarperCollins Publishers. Copyright 1986 by John Wiseman.

Figure 10 Wedge

Cutting Logs

Before starting to use an axe, ensure that there is no one in the work area.

To remove branches, chop on the outside of the fork (as illustrated in Figure 11). Make sure to stand on the other side of the log to prevent injury (as illustrated in Figure 12). Always cut towards the tip of the tree.

To chop a log into shorter pieces, stand facing the log, feet wider than shoulder width, axe in hand, arm and axe length from the log. If is too close to the log, the axe head may pass over the log causing the axe handle to strike the log and break. If the person cutting the log is too far from the log, the axe head may strike the ground. Start the cut by striking the log a few times at a 45 degree angle left of the center of the cut. Create a V shape as wide as the log is round. Repeat this on the right side of the center of the cut. Alternate blows to either side of the cut. When possible, cut past the half way point, roll the log over and continue chopping from that side. The final blows should be done with caution as hitting the ground with the axe will dull it immediately.

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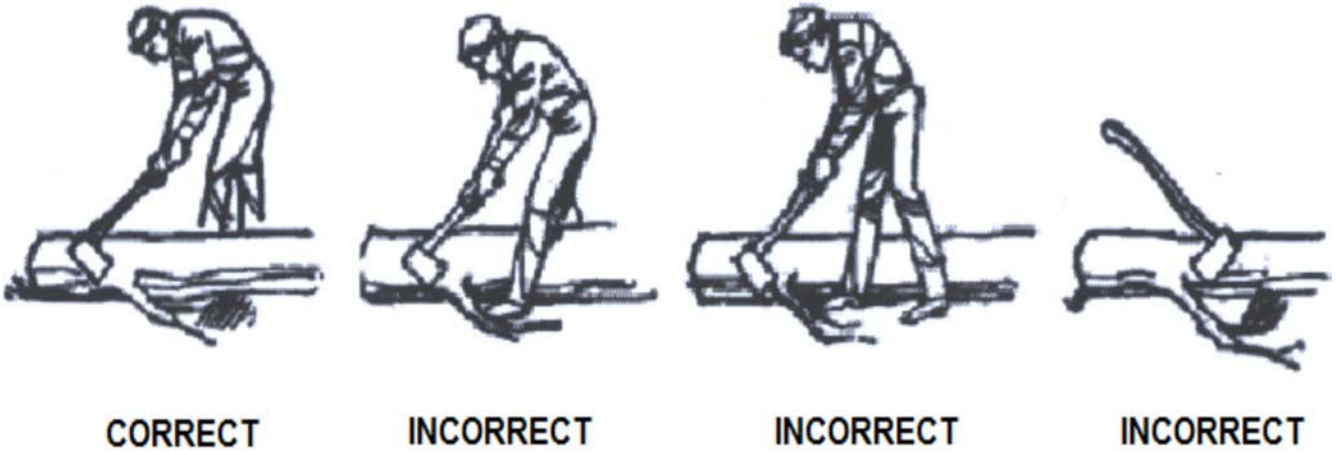
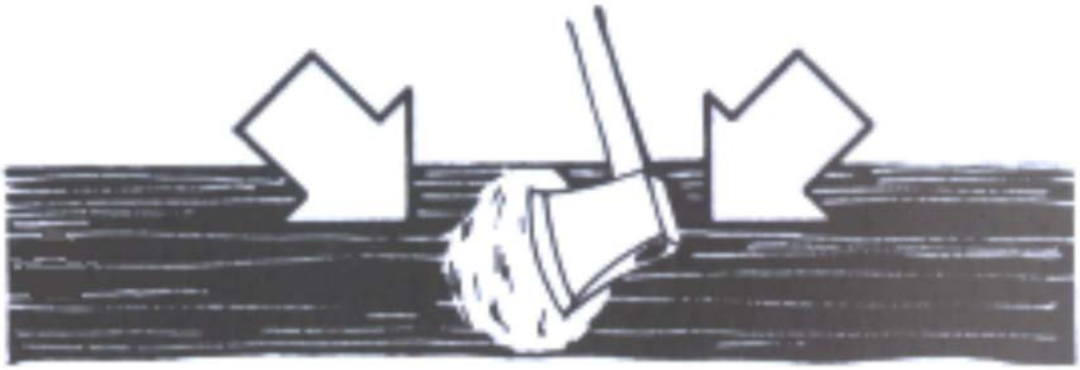
Note. From The SAS Survival Handbook (p. 306), by J. Wiseman, 1999, Hammersmith, London: HarperCollins Publishers. Copyright 1986 by John Wiseman.

Figure 11 Removing Branches 1



Note. From Scoutingresources.org/camping, Copyright 2007 by Scouting Resources. Retrieved November 19, 2007, from http://www.scoutingresources.org.uk/camping_axe.html

Figure 12 Removing Branches 2



Note. From The SAS Survival Handbook (p. 306), by J. Wiseman, 1999, Hammersmith, London: HarperCollins Publishers. Copyright 1986 by John Wiseman.

Figure 13 Log Chopping 1

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Note. From scoutingresources.org/camping, Copyright 2007 by Scouting Resources. Retrieved November 19, 2007, from http://www.scoutingresources.org.uk/camping_axe.html

Figure 14 Log Chopping 2

Always look at the place the axe will hit. When practicing it is a good idea to put a chalk mark on the log and try to hit it.

After each swing make sure to look around and check for people close by.

Clear chippings away regularly and use them for kindling.

USING A BOW SAW

Before beginning, ensure that there is no one in the immediate area.

A bow saw is an efficient wood cutting tool when used properly. The wood being sawn must be supported so it cannot move. The saw should be held by one hand at the handle just above the blade. The other hand is placed at the top of the bow. The hand holding the handle supplies the power to the stroke. The upper hand guides the saw without applying any downward pressure.

To start the cut, place the saw blade where the wood is to be cut and pull the saw backward. At first it may be difficult to push and pull the blade as very few teeth are in contact with the wood causing the teeth to dig in. As the saw cuts deeper, it will be easier to push and pull as more teeth become supported by the wood. Avoid pushing down on the bow as this will cause the teeth to dig deep into the wood stopping the saw. Maintain rhythm while pushing and pulling. The teeth of the saw blade are set, meaning each tooth is alternately bent to the left or right of the blade. This removes chips wider than the blade preventing the saw from sticking in the wood. Ease up and slow down near the end of the cut.

The diameter of the piece of wood being cut should be less than half the length of the blade. This will allow the wood chips to be pushed clear the kerf (the width of the cut).

Avoid using one hand to hold the wood while sawing with the other. The wood being cut can be held down by a helper.

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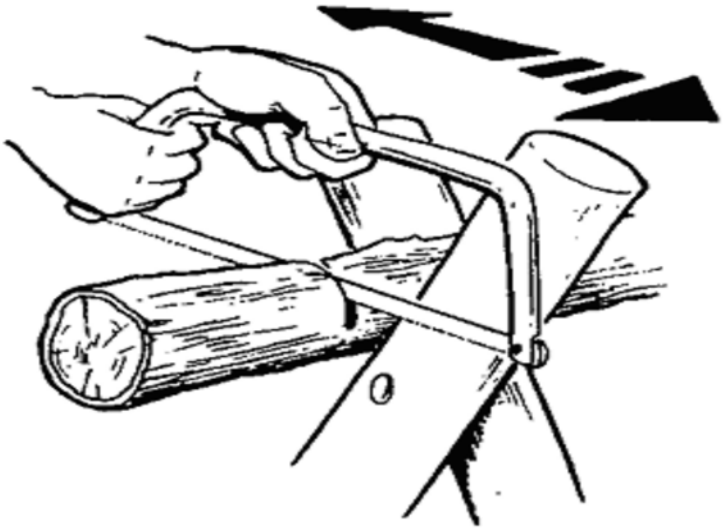
Always cover the blade of the saw after each use by using either a plastic 'clip-on' mask or tie a length of canvas around the blade.



Note. From scoutingresources.org/camping, Copyright 2007 by Scouting Resources. Retrieved November 19, 2007, from http://www.scoutingresources.org.uk/camping_axe.html

Figure 15 Cutting With a Bow Saw

CONFIRMATION OF TEACHING POINT 3

The cadets' using an axe and a bow saw to cut wood will serve as the confirmation of this TP.

Teaching point 4 **Explain, demonstrate and have the cadets use a shovel.**

Time: 15 min Method: Demonstration and Performance

For this skill lesson, it is recommended that instruction take the following format:

(1) Explain and demonstrate the complete skill while cadets observe.

(2) Explain and demonstrate each step required to complete the skill. Monitor cadets as they imitate each step.

(3) Monitor the cadets' performance as they practice the complete skill.

Note: Assistant instructors may be employed to monitor the cadets' performance.

Ensure that the area where the hole will be dug is marked. Areas with roots and rocks should be avoided.

DIGGING A HOLE

Place the tip of the shovel on top of the ground. The blade of the shovel should be vertical before digging into the ground. Place one foot on top of the shovel blade and while pushing down, rock the shovel from side to side. Once the blade of the shovel is in the ground pull back 45 degrees to free the soil. If the shovel will not pull back, reposition it around the hole. With one hand midway down the shovel shaft and the other at the top

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using the leg muscles, lift the soil from the hole. Place the soil in a pile close to the hole. Continue to dig the hole until it is 30 cm deep into the ground.

FILLING THE HOLE

Holes that are no longer needed should be filled in. To fill the hole, push the blade of the shovel into the soil and then lift the soil into the hole. Repeat until the hole is filled. Pack the soil down to make the soil even with the rest of the earth. Sod should be replaced and the area groomed to remove all signs of the hole.

CONFIRMATION OF TEACHING POINT 4

The cadets' participation in using a shovel to dig a hole and to fill a hole will serve as the confirmation of this TP.

END OF LESSON CONFIRMATION

The cadets' practicing of safe toolcraft will serve as the confirmation of this lesson.

CONCLUSION

HOMEWORK / READING / PRACTICE

Nil.

METHOD OF EVALUATION

Nil.

CLOSING STATEMENT

It is important for the cadets to be able to use tools on an aircrew survival exercise. Tools support aircrew survival training by assisting in setting up a field exercise, erecting tents, starting fires. The cadets need to know how to safely use and care for tools to prevent accidents.

INSTRUCTOR NOTES / REMARKS

Sharpening should only be done under close supervision of trained staff members, to prevent unnecessary damage to the equipment and injury to cadets.

Cadets who are qualified Survival Instructor may assist with this instruction.

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C3-003 ISBN 1-896713-00-9 Tawrell, P. (1996). *Camping and wilderness survival: The ultimate outdoors book*. Green Valley, ON: Falcon Distribution.

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