**ROYAL CANADIAN ARMY CADETS**

**SILVER STAR**

**INSTRUCTIONAL GUIDE**

**SECTION 3**

# EO M324.03 – LIGHT A FIRE WITHOUT MATCHES

Total Time: 120 min

## PREPARATION

### PRE-LESSON INSTRUCTIONS

Resources needed for the delivery of this lesson are listed in the lesson specification located in A-CR-CCP-703/PG-001, 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.

Photocopy instructions located at Annexes A to D for each cadet.

### PRE-LESSON ASSIGNMENT

N/A.

### APPROACH

An interactive lecture was chosen for TP 1 to orient cadets to methods of lighting a fire without matches and generate interest in the topic.

Demonstration was chosen for TP 2 as it allows the instructor to demonstrate and explain different methods of lighting a fire without matches.

Performance was chosen for TP 3 as it allows the cadets to practice lighting a fire without matches while under supervision.

## INTRODUCTION

### REVIEW

The review for this lesson is taken from EO M224.05 (Prepare, Light, Maintain and Extinguish a Fire, A-CR-CCP-702/PF-001, Chapter 14, Section 5).




Before conducting training in provincial or national parks, one must confirm that fires are allowed. Open fires are normally only allowed in designated areas. Open fires are fires that are not contained in a structure or housing that ensures the fire will not spread (eg, barrel or fireplace).

Each park will clearly state their fire regulations and restrictions.



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Parks commonly follow the Fire Weather Index, which provides an assessment of relative fire potential that is based solely on weather observations. Check with park administration for rules and regulations when planning to light fires within the park boundaries.

## CANADIAN FOREST FIRE DANGER RATING SYSTEM (CFFDRS)

The CFFDRS is Canada's national system for rating forest fire danger. The system evaluates and integrates data to help managers predict woodland fire potential.

The CFFDRS provides an index (as illustrated in Figure 1) on how easy it is to ignite vegetation, how difficult a fire may be to control, and how much damage a fire may do.

| BLUE | GREEN | YELLOW | ORANGE | RED |
|---|---|---|---|---|
| LOW | MODERATE | HIGH | VERY HIGH | EXTREME |

*Director Cadets 3, 2007, Ottawa, ON: Department of National Defence*

Figure 1 CFFDRS Fire Index

**Low.** Low chance of fires occurring. Fires that do occur are likely to be self-extinguishing and new ignitions are unlikely.

**Moderate.** Moderate chance of fires starting. These fires are creeping or gentle surface fires. They are easily contained by ground crews with water pumps.

**High.** High chance of fire starting. These fires are challenging for ground crews to handle and heavy equipment (tanker trucks and aircraft) are often required to contain the fire.

**Very High.** Very high chance of a fire starting. These fires are fast spreading and are of high intensity. They are hard to control and require aircraft support.

**Extreme.** The environment is very dry and chances of fire are extreme. These fires are fast spreading, of high intensity and very difficult to control.



Review this information by looking up the CFFDRS on the Internet at https://nofc1.cfsnet.nfis.org/mapserver/cwfis/index.phtml.

## MAINTAINING A SAFE FIRE SITE

Prior to starting a fire, ensure fire safety equipment is available.

**Shovel.** A shovel provides a means to smother the fire. Shovelling dirt, gravel or sand on a fire reduces oxygen, thus extinguishing the fire.

**Rake.** A rake allows one to disperse burning material away from the fire. A rake can also be used to smother the fire by raking dirt, gravel, or sand onto the fire.

**Pail Filled With Sand or Water.** A pail of water or sand can be immediately thrown over a fire if it starts to get out of control and can be refilled as many times as required.

**Fire Extinguisher.** A fire extinguisher is designed to tackle a fire for a short duration. It is very effective in extinguishing a small fire that is getting out of control.

## CHOOSING A SAFE FIRE LOCATION

Before beginning to build a fire, think about the location. It should be placed for maximum warmth and convenience without sacrificing safety. Consider the following when choosing a safe fire location:



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Verify against the official publication.

- The fire site should be high and dry.
- The area should be sheltered and away from windy areas to reduce flare ups.
- The site should be clear of over-hanging boughs and branches.
- All combustible materials shall be cleared from the fire site.
- The site should be 1.8 m (4–6 feet) from the shelter entrance.

**OBJECTIVES**

By the end of this lesson the cadet shall follow the process to light a fire without matches.

**IMPORTANCE**

It is important for cadets to be able to light a fire without matches. The second element of the survival pattern is fire, which provides heat, light and comfort. A fire also provides a means to cook food, scare away animals and signal rescuers if the cadet becomes lost and is in a survival situation without a survival kit.

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**Teaching point 1** **Identify Methods of Lighting a Fire Without Matches**

Time: 20 min Method: Interactive Lecture

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This information in this TP is background information relating to the different methods of lighting a fire without matches.

**ALTERNATIVE METHODS OF LIGHTING A FIRE**

In a survival situation, there may not be matches available to light a fire. In these situations it is necessary to find alternative methods to light a fire.

**Bow and Drill**

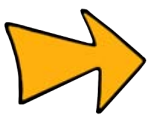
The bow and drill uses friction and pressure to heat a piece of wood and create a fine black powder that will light tinder. This method takes practice, but can easily be repeated over and over with materials found in the environment.

**Fire Saw**

The fire saw is a method that involves rubbing the bevelled edge of a stick in the notch of a fireboard. This method is commonly used in the jungle or a moist environment.

**Flint and Steel**

This is the best method to light tinder aside from matches. The flint and steel method uses shavings that have been struck from flint by a sharp knife to ignite timber.



A magnesium fire block is similar to flint and steel but incorporates a chunk of magnesium in aluminium that can be shaved off to assist in lighting. Cut or scratch shavings off the block which are ignited by striking the back of a knife on the flint rod. Magnesium generates tremendous heat. Be careful that no shavings land on skin or clothing.



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**Sun and Glass**

A convex lens (a lens where the centre bulges out) from binoculars, a lens from a camera or telescope, the bottom of an old pop bottle or can, a piece of ice or a magnifying glass may be used to light tinder with the help of the sun.

Fire can be created from an old pop can and a chocolate bar. The bottom of the pop can is shaped like a lens but is not very reflective. Polish the bottom of the can with chocolate, like polishing a pair of boots until it has a mirror finish. Use the sun to focus the light onto tinder. This method takes a lot of time, but it works.

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**CONFIRMATION OF TEACHING POINT 1**

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**QUESTIONS**

Q1. What are different methods of lighting a fire?

Q2. How does the bow and drill method work?

Q3. How does the flint and steel method work?

**ANTICIPATED ANSWERS**

A1. Bow and drill, fire saw, flint and steel and sun and glass are different methods of lighting a fire.

A2. The bow and drill method uses friction and pressure to heat a piece of wood and create a fine black powder that will light tinder.

A3. The flint and steel method uses shavings that have been struck from flint by a sharp knife to ignite timber.

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**Teaching point 2** **Demonstrate Methods of Lighting a Fire**

Time: 30 min Method: Demonstration

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Demonstrate the following methods of lighting a fire. There is no requirement to create fire, but each method should be explained and demonstrated.

**Bow and Drill (Spindle)**

The following steps are required to light a fire with a bow and drill:

1. Collect the following materials:
   a. one hardwood shaft 2 cm thick and 30 cm long,
   b. one softwood base 5 cm wide, 20 cm long and 2 cm thick,
   c. one bearing block or socket,
   d. one stick 60–90 cm long to make the bow (green wood from a sapling is best), and
   e. one piece of cord.

2. Cut a groove in the bearing block or socket 3–5 cm deep for the hardwood shaft to fit (as illustrated in Figure 2).



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*P. Tawrell, Camping and Wilderness Survival: The Ultimate Outdoors Book (2nd ed.), Paul Tawrell (p. 434)*

Figure 2 Bearing Block

3. Cut a groove into the softwood base in which the hardwood shaft will spin. The groove should be open on one end for the heat and embers to escape (as illustrated in Figure 3).




*P. Tawrell, Camping and Wilderness Survival: The Ultimate Outdoors Book (2nd ed.), Paul Tawrell (p. 434)*

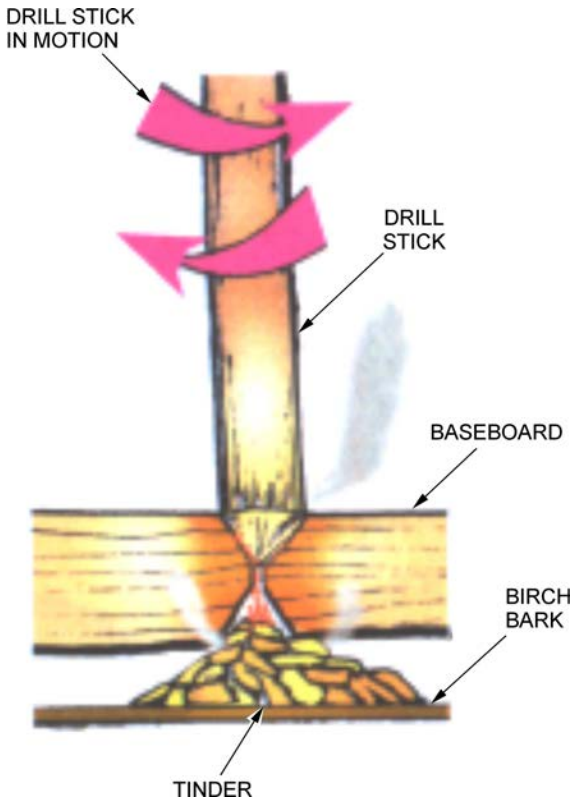
Figure 3 Softwood Base

4. Carve one end of the hardwood shaft into a small point.

5. Place tinder in the opening in which the embers will fall.



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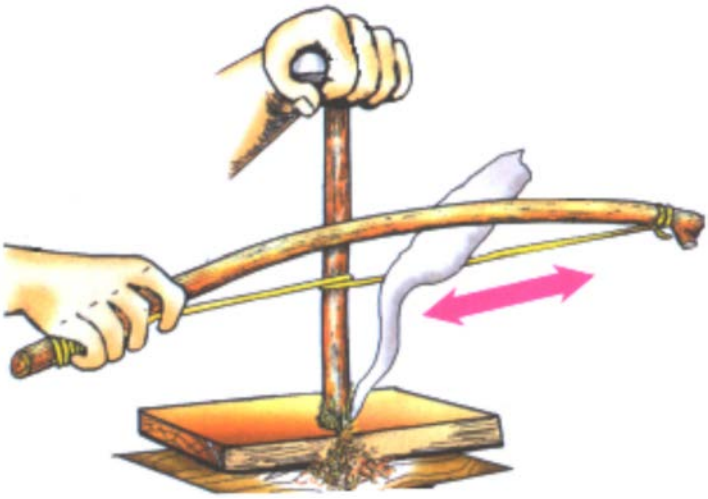

*P. Tawrell, Camping and Wilderness Survival: The Ultimate Outdoors Book (2nd ed.), Paul Tawrell (p. 434)*

Figure 4 Drill

6. Wrap the bow around the hardwood shaft and place it into the groove of the softwood base.

7. Place the bearing block on the top of the shaft.

8. Slowly at first, start a sawing motion with the bow back and forth so the hardwood shaft spins back and forth.



*P. Tawrell, Camping and Wilderness Survival: The Ultimate Outdoors Book (2nd ed.), Paul Tawrell (p. 434)*

Figure 5 Fire Bow and Drill

9. Maintain a constant motion back and forth; consistency is more important than speed.



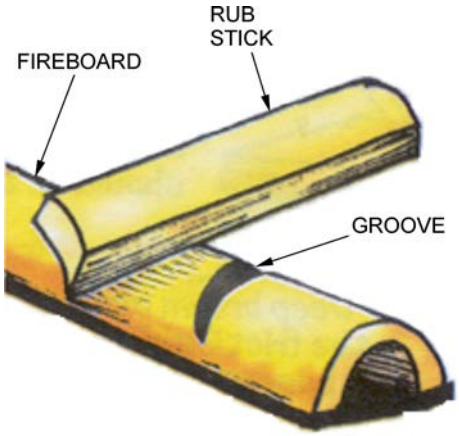
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10. Once smoke appears increase speed and look for embers to start to appear.
11. Once the tinder begins to smoke, stop and lightly blow on the tinder to start combustion.
12. When the tinder lights, apply gathered kindling and fuel as required.

**FIRE SAW**

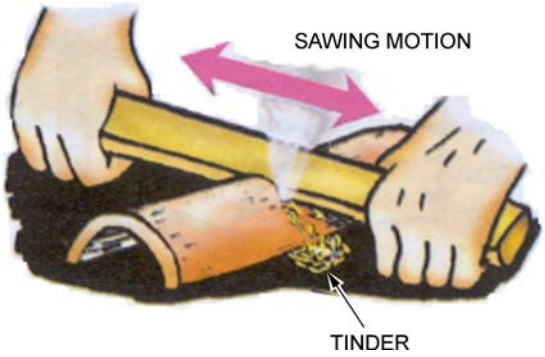
The fire saw consists of two pieces of dry wood: one rubbed vigorously against the other in a sawing motion.

Use a half a piece of split wood as the fireboard and a piece of softwood as a rub stick. Good tinder for the fire saw is material that is light and fluffy such as dried mosses or lichen such as old man's beard.




*P. Tawrell, Camping and Wilderness Survival: The Ultimate Outdoors Book (2nd ed.), Paul Tawrell (p. 434)*

Figure 6 Fire Saw




*P. Tawrell, Camping and Wilderness Survival: The Ultimate Outdoors Book (2nd ed.), Paul Tawrell (p. 434)*

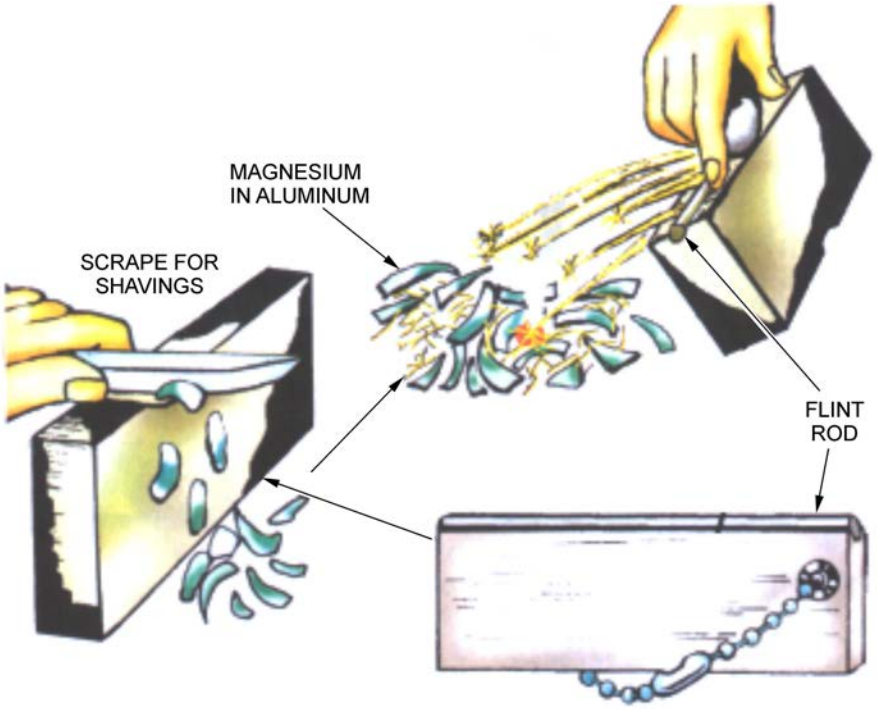
Figure 7 Fire Saw in Motion

**FLINT AND STEEL**

Hold the flint as close to the tinder as possible and strike it with the back of a knife blade or a small piece of carbon steel. Strike downward to scrape magnesium so that the sparks fall into the tinder. When the tinder begins to smoulder, fan or blow gently into a flame.



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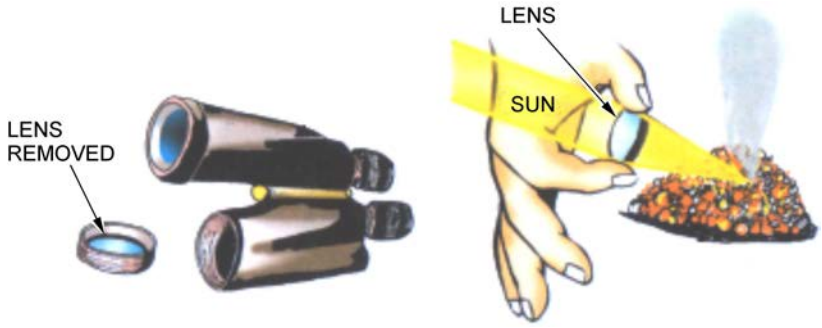



*P. Tawrell, Camping and Wilderness Survival: The Ultimate Outdoors Book (2nd ed.), Paul Tawrell (p. 436)*

Figure 8 Flint and Steel

**SUN AND GLASS**

Use a piece of convex glass to concentrate rays of the sun on the tinder and hold until the tinder begins to smoke.




*P. Tawrell, Camping and Wilderness Survival: The Ultimate Outdoors Book (2nd ed.), Paul Tawrell (p. 437)*

Figure 9 Sun and Glass

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**CONFIRMATION OF TEACHING POINT 2**

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The cadets' participation in the activity in TP 3 will serve as the confirmation of this TP.



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**Teaching point 3** **Have the Cadets Practice Lighting a Fire**

Time: 60 min Method: Performance




The cadets will practice lighting a fire without matches. There is no requirement for the cadet to create fire.

If time allows, a subsequent method should be attempted.

## ACTIVITY

### OBJECTIVE

The objective of this activity is to have the cadets construct and practice lighting a fire without matches.

### RESOURCES

- Flint and steel,
- Glass,
- 1.8-kg (4-lb) axe with a 91-cm (36-inch) handle,
- 60-cm (24-inch) bow saw,
- Pail filled with sand or water,
- Tinder,
- Kindling,
- Knife,
- Hardwood shaft 2 cm thick and 30 cm long,
- Softwood base 5 cm wide, 20 cm long and 2 cm thick,
- One bearing block or socket,
- One stick 60–90 cm long to make the bow (green wood from a sapling is best),
- Cord,
- Water, and
- Shovel.

### ACTIVITY LAYOUT

N/A.

### ACTIVITY INSTRUCTIONS

1. Have the cadets attempt to light a fire without matches, using one of the following methods:
   a. bow and drill,
   b. fire saw,
   c. flint and steel, and



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d. sun and glass.

2. Have the cadets choose a method from the ones listed above.

3. Distribute the handouts of instructions located at Annexes A to D.

4. Distribute materials to cadets.




There is no requirement for the cadets to light a fire, since it is a challenging skill to master. Cadets are only required to construct and attempt one method, but may attempt another, if time permits.

**SAFETY**

- Firefighting equipment must be present during the lighting of fires.
- Additional instructors may be required to all cadets are attempting this activity simultaneously.

## CONFIRMATION OF TEACHING POINT 3

The cadets' participation in practicing to light a fire will serve as the confirmation of this TP.

## END OF LESSON CONFIRMATION

The cadets' participation in practicing to light a fire by bow and drill, fire saw, flint and steel or sun and glass will serve as the confirmation of this lesson.

## CONCLUSION

**HOMEWORK/READING/PRACTICE**

N/A.

**METHOD OF EVALUATION**

This EO is assessed IAW A-CR-CCP-703/PG-001, Chapter 3, Annex B, Appendix 6 (324 EC-03).

**CLOSING STATEMENT**

It is important for cadets to be able to light a fire without matches. The second element of the survival pattern is fire, which provides heat, light and comfort. A fire also provides a means to cook food, scare away animals and signal rescuers if the cadet becomes lost.

**INSTRUCTOR NOTES/REMARKS**

N/A.

## REFERENCES

C0-111 (ISBN 0-9740820-2-3) Tawrell, P. (2002). *Camping and Wilderness Survival: The Ultimate Outdoors Book*. Green Valley, ON: Paul Tawrell.



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C2-148 (ISBN 978-0-8118-3292-5) Davenport, G. (2006) *Wilderness Survival* (2nd ed.). Mechanicsburg, PA: Stackpole Books.



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