ROYAL CANADIAN ARMY CADETS

RED STAR

INSTRUCTIONAL GUIDE

SECTION 3

EO M224.03 – PREDICT WEATHER USING CLOUD FORMATIONS

Total Time: 30 min

PREPARATION

PRE-LESSON INSTRUCTIONS

Resources needed for the delivery of this lesson are listed in the lesson specification located in A-CR-CCP-702/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.

PRE-LESSON ASSIGNMENT

N/A.

APPROACH

An interactive lecture was chosen for this lesson to introduce predicting weather using cloud formations as a new subject and to present basic or background material.

INTRODUCTION

REVIEW

N/A.

OBJECTIVES

By the end of this lesson the cadet shall be expected to predict the weather using cloud formations.

IMPORTANCE

It is important for cadets to learn to predict weather using cloud formations so they can factor the weather into their survival plan, if they become lost. The weather will play an important role when selecting the best action to take while waiting for assistance from rescuers and when deciding the type of shelter to seek or construct.

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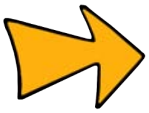
Teaching point 1 **Identify Types of Clouds**

Time: 15 min Method: Interactive Lecture

TYPES OF CLOUD FORMATIONS



The terms cumulus and stratus are used in most cloud names. In most cases, the height of a cloud will be the prefix (beginning element of a word) and the type will be the suffix (the end element of a word). Discuss the types of cloud formations.



Cloud names come from Latin. Some common words are:

- cirro = high;
- alto = middle;
- nimbus = rain;
- cirrus = curl;
- stratus (as a prefix) = low;
- stratus (as a suffix) = layer; and
- cumulus = pile.

Clouds are classified into two categories based on how they are formed – cumulus and stratus.

Cumulus. The typical clumpy, “puffy” cloud is formed in rising air currents. Cumulus clouds are evidence of unstable air conditions. Cumulus clouds are formed when small areas of rising air cool to the saturation point.

Stratus. These appear “spread out” and in sheets or horizontal layers. Stratus clouds are formed when a layer of moist air is cooled below its saturation point.



Precipitation falls from nimbus clouds.



Cool air can hold less water than warm air. As a given amount of air cools, humidity increases. When the humidity reaches 100 percent, clouds form. This is the saturation point.

FAMILIES OF CLOUDS



This section includes descriptions of clouds found in each family and weather predictions for each.

Cadets should be able to describe the look of each cloud. Weather will be discussed further in TP2.

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Clouds are classified into four families – high clouds, middle clouds, low clouds and clouds of vertical development.

High Clouds

These clouds are very high in the sky and are composed of ice crystals. High clouds have the prefix “cirro”. There are three types – cirrus, cirrocumulus, and cirrostratus.

Cirrus. These clouds are wispy and look like cotton candy being pulled. They appear to be whitish wisps of cloud and are usually an indicator of fair weather.



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Figure 1 Cirrus Clouds

Cirrostratus. These clouds are whitish sheets that completely cover the sky. Cirrostratus clouds are normally see-through. When these clouds are in the sky, one can expect precipitation in a day or two.



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Figure 2 Cirrostratus Clouds

Cirrocumulus. These clouds are little, white and puffy. They form a huge sheet, covering the sky. When cirrocumulus clouds are in the sky, one can predict fair weather.

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Figure 3 Cirrocumulus

Middle Clouds

These clouds are in the middle of the sky and are composed of ice crystals or water droplets. Middle clouds have the prefix “alto”. There are two main types – altocumulus and altostratus.

Altocumulus. These clouds are very big and can be white or grey. They appear as a layer or a series of patches of rounded masses. Altocumulus clouds can be seen before fair or bad weather and have little value as an indicator of future weather developments.



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Figure 4 Altocumulus

Altostratus. These clouds appear as a greyish or whitish sheet that completely covers the sky. The sun can vaguely be seen through it. Altostratus clouds indicate increasing moisture and usually precede precipitation by 24 hours or less.

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Figure 5 Altostratus

Low Clouds

These clouds are low in the sky and are composed of water droplets. Low clouds are associated with “stratus”. There are three types – stratus, stratocumulus, and nimbostratus.

Stratus. These clouds appear as low, dull, greyish sheets that completely cover the sky (resembling fog). During the day, the sun cannot be seen. They can produce drizzle or very light rain or snow. When deep clouds are above, the rain or snow can be heavier.



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Figure 6 Stratus

Stratocumulus. These appear as sheets of big puffy white or grey clouds. Stratocumulus clouds often appear in dark patches or rolls and are often thin with blue sky showing through the breaks. Snow or showers of rain are possible and can be heavy.

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Figure 7 Stratocumulus

Nimbostratus. These appear as dark grey layers of large, puffy clouds. When they produce precipitation, it is in the form of continuous rain or snow. The bottom of this cloud is often hidden by falling rain or snow, which may be heavy.



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Figure 8 Nimbostratus

Clouds of Vertical Development

These clouds may be very low in the sky. When the temperature is above freezing (higher than zero degrees), they are composed of water droplets. When the temperature is below freezing (lower than zero degrees), they are composed of ice crystals and water droplets. Clouds of vertical development are associated with “cumulus”. There are three types – cumulus, towering cumulus, and cumulonimbus.

Cumulus. These clouds are large, individual puffy clouds. They resemble cauliflower or cotton balls. The bottoms often appear dark and flat. They can often be seen on a warm day. When these clouds are in the sky one can expect fair weather, unless they begin to extend upwards.

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Figure 9 Cumulus

Towering Cumulus. These clouds build up into high towering masses. They have puffy, white tops but very dark bottoms. Towering cumulus clouds can produce showers and may develop into heavy ice or thunderstorms.



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Figure 10 Towering Cumulus

Cumulonimbus. These clouds are very dark at the bottom. They extend way up into the atmosphere and have flattened tops. When cumulonimbus clouds are in the sky, one can predict thunderstorms and windy, rainy conditions.

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Figure 11 Cumulonimbus

The long, narrow white clouds left behind jet airplanes are called contrails. They are formed by the moisture coming out of the engine and condensing in the very cold air.

CONFIRMATION OF TEACHING POINT 1

QUESTIONS

Q1. What are the three clouds found in the high cloud family?

Q2. What does an altocumulus cloud look like?

Q3. What does a nimbostratus clouds look like?

ANTICIPATED ANSWERS

A1. Cirrus, cirrostratus and cirrocumulus.

A2. These clouds are very big and can be white or grey. They appear as a layer or a series of patches of rounded masses.

A3. These appear as dark grey layers of large, puffy clouds.

Teaching point 2 **Discuss How to Predict Approaching Weather Using Clouds**

Time: 10 min Method: Interactive Lecture

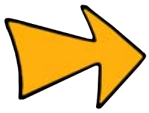
Being able to forecast weather using clouds is a great tool in the field. Discuss the signs that clouds give when the weather is going to change.

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BAD WEATHER

When the weather is going to **change for the worse**, one will notice several general cloud activities. Signs of change for the worse are:

- Clouds (regardless of their formation) are thickening (darkening), increasing in number or joining together, forming layers, and/or lowering in elevation.
- Clouds are forming banks in the west with winds from the south.
- Clouds are moving in all directions, or contrary to the ground wind.
- Altostratus clouds are darkening and lowering.
- Altocumulus clouds are moving quickly across the sky or forming towers in the morning.
- Cumulus clouds are forming in the morning and stacking in the afternoon or moving from the south or south-west.



A halo around the moon indicates that the weather is going to change for the worse.

GOOD WEATHER

When the weather is going to **change for the better**, one will notice several general cloud activities. Signs of a change for the better are:

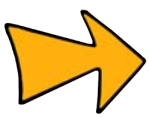
- Cloud cover is lifting, becoming lighter and small patches of blue sky are developing.
- Cumulus clouds are forming in the afternoon or floating alone without stacking.
- Stratocumulus clouds are drifting with the prevailing wind and remaining scattered.
- The condensation trail (‘contrail’) left by high altitude aircraft is dispersing quickly.
- Morning fog is burning off before noon.

THUNDERSTORMS/LIGHTNING

Thunderstorms. Thunderstorms are most common in the summertime. They are formed by cumulus clouds, feeding off warm and moist air. These clouds grow quickly during the day, driven by the heat from the sun. When dark cumulonimbus clouds begin to approach, one can expect a thunderstorm. The big feature of a thunderstorm is lightning.

Lightning. Lightning is an electrical discharge in the atmosphere. When cumulus clouds grow tall, they develop an electrical field. The top of the cloud, where there are lots of ice crystals, is normally positive. The bottom part of the cloud, filled with rain droplets, is normally negative. The ground has a positive charge. An electrical charge builds up and the atmosphere produces lightning.

Thunder. Thunder is the sound made when a lightning bolt heats the air and expands quickly. Since sound moves much slower than light, one can judge how far away a lightning bolt is by counting the seconds between seeing the flash and hearing the thunder. Each three second interval equals about one kilometre.



The fear of lightning is called *astraphobia*. The fear of thunder is called *brontophobia*.

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As mentioned in TP1, weather can also be predicted simply from knowing the type of cloud in the sky. Discuss the expected weather for each type of cloud.

HIGH CLOUDS	
Cirrus	Normally an indicator of fair weather.
Cirrocumulus	Expect precipitation in a day or two.
Cirrostratus	Predict fair weather.
MIDDLE CLOUDS	
Altocumulus	Normally seen before fair or bad weather. Have little value as an indicator of future weather developments.
Altostratus	Expect precipitation in 24 hours or less.
LOW CLOUDS	
Stratus	Expect drizzle, light rain or snow.
Stratocumulus	Snow or showers are possible and can be heavy.
Nimbostratus	Expect rain or snow.
CLOUDS OF VERTICAL DEVELOPMENT	
Cumulus	Expect fair weather, unless they begin to extend upwards.
Towering Cumulus	Expect showers. May develop into heavy ice or thunderstorms.
Cumulonimbus	Expect thunderstorms and showery conditions.

CONFIRMATION OF TEACHING POINT 2

QUESTIONS

Q1. What are the common signs of a change in the weather for the worse?

Q2. What are the two middle clouds and what weather can be predicted when they are seen in the sky?

Q3. What is lightning?

ANTICIPATED ANSWERS

A1. Signs of change for the worse are:

- Clouds (regardless of their formation) are thickening (darkening), increasing in number or joining together, forming layers, and/or lowering in elevation.
- Clouds are forming banks in the west with winds from the south.
- Clouds are moving in all directions, or contrary to the ground wind.
- Altostratus clouds are darkening and lowering.

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- Altocumulus clouds are moving quickly across the sky or forming turrets in the morning.
- Cumulus clouds are forming in the morning and stacking in the afternoon or moving from the south or south-west.

A2.

MIDDLE CLOUDS	
Altocumulus	Normally seen before fair or bad weather. Have little value as an indicator of future weather developments.
Altostratus	Expect precipitation in 24 hours or less.

A3. Lightning is an electrical discharge in the atmosphere. When cumulus clouds grow tall, they develop an electrical field. The top of the cloud, where there are lots of ice crystals, is normally positive. The bottom part of the cloud, filled with rain droplets, is normally negative. The ground has a relatively positive charge. An electrical charge builds up and the atmosphere produces lightning.

END OF LESSON CONFIRMATION

QUESTIONS

Q1. What are the three high clouds, including their description and weather prediction?

Q2. What are the three types of low clouds, including their description and weather prediction?

Q3. What are the common signs of a change in the weather for the better?

ANTICIPATED ANSWERS

A1. The high clouds include:

- **Cirrus.** These clouds are wispy and look like cotton candy being pulled. They have whitish wisps of cloud and are usually an indicator of fair weather.
- **Cirrostratus.** These clouds are whitish sheets that completely cover the sky. They are normally see-through. When these clouds are in the sky, one can expect precipitation in a day or two.
- **Cirrocumulus.** These clouds are little, white and puffy. They form a huge sheet, covering the sky. When these clouds are in the sky, one can predict fair weather.

A2. The low clouds include:

- **Stratus.** These clouds are low, dull, greyish sheets that completely cover the sky (resembling fog). During the day, the sun cannot be seen. They can produce drizzle or very light rain or snow. When deep clouds are above, the rain or snow can be heavier.
- **Stratocumulus.** These are sheets of big puffy white or grey clouds. They are often in dark patches or rolls and are often thin with blue sky showing through the breaks. Snow or showers of rain are possible and can be heavy.
- **Nimbostratus.** These are dark grey layers of large, puffy clouds. When they produce precipitation, it is in the form of continuous rain or snow. The bottom of this cloud is often hidden by falling rain or snow, which may be heavy.

A3. Signs of change for the better are:

- Cloud cover is lifting, becoming lighter and small patches of blue sky are developing.
- Cumulus clouds are forming in the afternoon or floating alone without stacking.

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- Stratocumulus clouds are drifting with the prevailing wind and remaining scattered.
- The condensation trail (‘contrail’) left by high altitude aircraft is dispersing quickly.
- Morning fog is burning off before noon.

CONCLUSION

HOMEWORK/READING/PRACTICE

N/A.

METHOD OF EVALUATION

N/A.

CLOSING STATEMENT

Being able to use the clouds to predict weather is a great tool when in a survival situation and when in the field. Weather is an important aspect of planning in any survival situation with respect to the type of shelter selected and the best course of action to take.

INSTRUCTOR NOTES/REMARKS

N/A.

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