

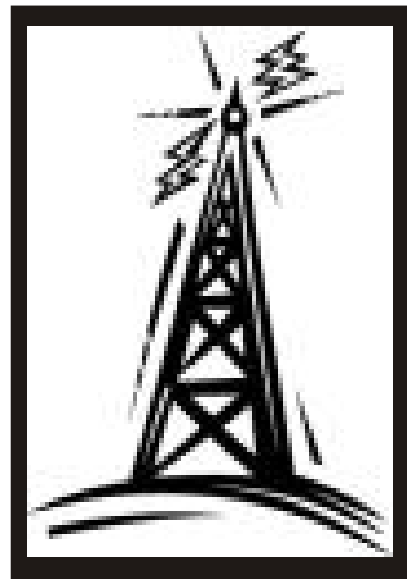


S-212 Communications



STUDENT MANUAL 2005

***BC SUPPRESSION
TRAINING SERIES***





S-212 (BC)

Fire Communications

STUDENT WORKBOOK



INSTRUCTORS PRESENTING THIS TRAINING
MODULE MUST BE FAMILIAR WITH RADIO
OPERATING PROCEDURES, EQUIPMENT AND
ELECTRONICS.

Recommendation: Training (when possible) is to be delegated
to appropriate Electronics Section personnel of the Ministry of
Forests.



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KNOWLEDGE OBJECTIVES

The objective of this module is:

To introduce trainees to radio communications in the B.C. Forest Service and the roles, authorities, and regulations of the Department of Communications and the Ministry of Forests.

To introduce trainees to radio station call signs, the phonetic alphabet, precise phraseology, and techniques for transmitting numbers and confusing words.

To introduce trainees to the three internationally recognized distress levels (i.e., MAYDAY, PAN-PAN, and SECURITY), plus outline how to transmit and respond to radio transmissions.

To introduce trainees to radio equipment used in the Forest Service and common FM and SSB radios used in fire communications.

SKILLS OBJECTIVES

Upon completion of this classroom session, you will be required to take part in a field exercise. Please ensure you have the necessary personal protective equipment and appropriate clothing.

During this exercise you will be required to demonstrate the following:

- change batteries in a hand-held radio; and
- use a hand-held radio to transmit and receive information.



RADIO COMMUNICATIONS

INTRODUCTION

The extent to which communications (radio, television, and telephone) influence our lives is immeasurable. Technological advances in communication systems have enhanced personal lifestyles, improved efficiency in the work environment and (possibly its greatest contribution) aided personnel responsible for public security: A value especially evident in police, fire, maritime, and air emergencies.

Early work in radio communication was preoccupied primarily with communicating with or linking wireless systems to remote mobile units and communicating with inaccessible locations (e.g., ships at sea).

The basic intent of early radio or more specifically, radiotelephone, was to provide a communication link where wires could not go. And although, early developments in radio and mobile communication technologies were aimed at specific applications, they were quickly adapted to suit the needs of both professional and nonprofessional organizations.

WHO CONTROLS RADIO WAVES?

Every day, Canadians use a multitude of radio services. This includes not only radio and television broadcasting but, a variety of specialized radio services: maritime, land, air, fixed, satellite, etc.

False distress signals — Any person who knowingly transmits, or causes to be transmitted, a false distress signal or message is guilty of an offence.

Confidentiality — Divulging, abusing, or using information overheard (other than transmissions on a public broadcast) is strictly prohibited.

Violators, on conviction, are liable to fines, imprisonment for a term not to exceed 12 months, or both.



RADIO COMMUNICATIONS

The Ministry of Forests

Forest Service policy and procedures prohibit the discussion of government policy, personnel matters, or the business transactions of private companies or enterprises. Transmissions are to exclude any discussion of the following:

- the private affairs of personnel/colleagues/others;
- salaries or unconfirmed appointments of personnel/colleagues/staff;
- remarks or opinion re: any person/colleague;
- remarks detrimental to any business establishment;
- prices/quotes/bids — discussion re: the business transactions of any company or the ministry; and
- any subject/topic/report which could bring discredit to the Ministry of Forests, its staff, programs and services.



TRANSMISSION TECHNIQUES/PROCEDURES

TRANSMISSION TECHNIQUES

The efficient use of radio depends to a large extent on the method of speaking and the articulation of the operator. Fuzziness, static, and outside interference can blur transmission. While many words, vowels, and some consonants (e.g., “p” and “b”; “f” and “s”) sound alike.

Mode of Speaking

Therefore, to avoid confusion, operators should speak plainly and clearly. Do not embellish the transmission. Stick to the point and be as brief as possible. Do not monopolize the radio. There may be other operators waiting to use the same frequency.

Observing many of the techniques and suggestions outlined in this chapter will ensure messages are transmitted with ease and are accurately received.

Be aware of:

Clarity - speak all words plainly and end each word clearly. Avoid running words together, shouting, artificially stressing syllables or speaking rapidly.

Speed - keep rate of utterance or speech constant and smooth, neither too fast nor too slow. Bear in mind, that the receiving operator is usually making notes or recording exact information such as coordinates/reference points.

Rhythm - preserve the rhythm of ordinary conversation. Stay calm, breathe evenly when transmitting and try to avoid unnecessary sounds such as “er” and “um”.



TRANSMISSION TECHNIQUES/PROCEDURES

PHONETIC ALPHABET - WORD SPELLING

Operators must be familiar with the phonetic alphabet adopted by the International Telecommunication Union. It is a radio transmission standard that is used when isolated letters, or groups of letters, are pronounced separately. It is also used when communication, because of interference or static, is difficult.



TRANSMISSION TECHNIQUES/PROCEDURES

Monetary Denominations

Monetary denominations, when transmitted with groups of digits, should be transmitted in the sequence in which they are written. For example:

Dollar Figure to Be Transmitted

Expressed As

0.75	Seventy-Five Cents
\$17.25	Dollars One Seven Day-See-Mal Two Five
\$1000.11	Dollars One Thousand Day-See-Mal One One

CHECK-INS

WORKERS' COMPENSATION BOARD REQUIREMENTS

WCB: Accident Prevention Regulations: - Article 8.32

Where a worker is employed under conditions which present a significant hazard of disabling injury, and when the worker might not be able to secure assistance in the event of injury or other misfortunes, the employer shall provide a means of periodically checking the well-being of the worker. Checks shall be made at such intervals and by such means as are appropriate to the nature, hazard and circumstances of the employment.

The current Forest Service procedure is four check-ins per day at approximately two hour intervals unless a high risk activity is being preformed (i.e. falling danger trees) in which the case the interval is adjusted as needed (usually 30 minutes). For aircraft the check-in period is reduced to every 30 minutes.



TRANSMISSION TECHNIQUES/PROCEDURES

WORDS AND PHRASES

It is not possible to be precise, nor is it practical to list comprehensive phraseology for all radiotelephone transmissions. Below is a list of several standard terms and phrases developed for radio communication.

Operators, when applicable, are expected to use the terms and phrases noted.

ACKNOWLEDGE Let me know that you have received and understood this message.

AFFIRMATIVE YES - permission granted.

CLEAR No further transmission from this station. Where possible this should be preceded by the call sign of the speaking person (i.e. 'BRAVO FOUR CLEAR')

CORRECTION An error has been made in the previous message. The correct version is... (*Provide corrected version*).

GO AHEAD Continue - proceed with your message.

NEGATIVE NO - permission not granted or NO I do not agree.

PLEASE REPEAT Please re-say your last transmission

RADIO CHECK Please tell me how you clearly you understand what I am saying.

ROGER or COPY I have received and understand all of your last transmission.

ROGER - OUT I have received and understand all of your last transmission and I have no need to communicate further at this time.

SAY AGAIN Please repeat. (Do not use the word repeat.)

STANDBY I am busy for a moment. Please wait and listen to the radio until I can get back to you. If more than one person is waiting it is a common practice to also use their name or call sign (i.e. 'STANDBY John' or 'STANDBY Bravo 4', etc.)

STANDING BY I have received your message to wait and will wait silently until you get back to me.

Call Sign – OUT (*Give your call sign and say the word 'OUT'*) My conversation has ended and no further response is expected.

OVER My transmission is ended and I expect a response from you.



TRANSMISSION TECHNIQUES/PROCEDURES

CALL SIGNS

Call Signs are unique identifiers used for radio operations. They link an individual or resource with an established set of information. They are the quickest and most efficient way to deal with station identification. For example an individuals call sign will identify a persons name, what their job position is, relevant medical data, physical characteristics (height, weight etc), next of kin etc to dispatch.

It is illegal to transmit an unidentified radio signals therefore call signs **must** be used for identification purposes when:

- initial contact is being established; and
- communication is concluded.

For example, the Strike Team Leader of the IA Crew, Hotel 71 attempting to reach his/her Fire Centre would identify him/herself as “Hotel Seven-One”. The transmission would begin as noted below:

“Kamloops Fire Centre, this is Hotel Seven-One. Over.”

“Hotel Seven-One, this is Kamloops Fire Centre. Go ahead.”

If you have not been assigned a formal call sign you are expected to identify yourself by stating your name followed by the term portable. For example.

“South East Fire Centre, this is Rexin portable. Over.”

“Rexin portable, this is South East Fire Centre. Go ahead.”

****Note** Always state the station you are calling before identifying yourself.**



TRANSMISSION TECHNIQUES/PROCEDURES

ENTERING AND WORKING IN AN ACTIVE LOGGING AREA

Active logging roads are often radio controlled. All users are expected to identify themselves and position on the road on a pre-established radio frequency. The right of way will then be established usually given to the vehicle travelling down the road.

Procedure: Check your vehicle radio / frequency list and compare it to what is posted at the entrance to the active logging road. Check your radio by calling someone before you enter the road. '*Call your kilometers*' identify your vehicle as you drive up or down the road with reference to the mileage signs. Listen carefully to all traffic you hear. Often times you will hear logging trucks identify themselves as empty (going up) or loaded (coming down.) Shut off all other radios (advise Fire Centre how long you will be out of contact for) and limit conversations.

If you must make a call on another channel - prior to switching channels:

- 1) Advise others that you are stopping and where you are stopping;
- 2) Stop your vehicle in a visible location out of the way of any passing vehicles.
- 3) Switch to your alternate channel and make your call.
- 4) Upon completion of the transmission on the alternate channel, switch back to the Logging Road Channel. This must be monitored and checked for logging frequency traffic and logging truck movement prior to proceeding.

Important: Make sure you are on the correct channel. If you do not know the frequency used in an active logging area. DO NOT enter this area. Contact the Zone Office or Fire Centre for information on the frequency used on that road.



INTERNATIONAL DISTRESS CALL/ANSWER

EMERGENCY COMMUNICATIONS

Distress, urgency, and safety procedures have been established by the International Telecommunications Union. Not unlike the phonetic alphabet and transmission phrases outlined in this chapter, emergency communications and procedures have also been standardized in order to be understood world-wide. Therefore, all operators and personnel expected to use radio equipment must become familiar with distress signals.

There are three levels of distress. Each level is identified by using the appropriate and internationally understood terminology: MAYDAY, PAN-PAN, or SECURITY. When a distress communiqué is transmitted, it is immediately followed by the distress station's call sign and location.

The distress term used, indicates the degree of distress or urgency and when transmitted, is always repeated three times.

This module contains information on how to proceed with MAYDAY distress transmissions, details how operators impose radio silence, and outlines the correct procedure for canceling a MAYDAY. This is all valuable information, but it is not likely that the average fire fighter will find him or herself imposing radio silence. New trainees are expected to know how to deal with an emergency and request immediate assistance by transmitting MAYDAY.



INTERNATIONAL DISTRESS CALL/ANSWER

MAYDAY — THE DISTRESS SIGNAL

The life-threatening distress signal, in radio communication, is the word “MAYDAY” spoken three times. This signal indicates that:

- personnel are threatened by grave and imminent danger and require immediate assistance. (The call is made on behalf of an individual in distress or, it may be the operator who is in distress); and
- personnel are aware of a camp, vehicle, ship, aircraft, etc. threatened by grave and imminent danger that requires immediate assistance. (The operator transmits the call on behalf of another station or personnel in distress.)

The following is a distress transmission from a church camp threatened by fire and in “grave and imminent danger”:

Signal: "MAYDAY, MAYDAY, MAYDAY"

This is: "THIS IS CHURCH CAMP XST109, THIS IS CHURCH CAMP XST109, THIS IS CHURCH CAMP XST109"

Position: "Two miles south of Blue Creek, on Ponderosa Ranch. Wildfire has changed direction, wind speed increasing. Require assistance to evacuate 100 children, many physically handicapped."



INTERNATIONAL DISTRESS CALL/ANSWER

Of course, the sample transmissions included in the text are fairly clinical and uncomplicated. In a real emergency situation, the receiving operator could find himself speaking to personnel under stress.

It is therefore important to stay controlled, to reassure the transmitting operator and to obtain all pertinent information (location, numbers in party, medical emergency, etc.) so that rescue is hastened and successful.

If the individual transmitting the MAYDAY is in shock, it is up to the receiving operator to make sure all pertinent information is obtained.

Imposing Radio Silence

The station in distress, or any station in the immediate vicinity, may impose silence on a particular station. This procedure is imposed if communication traffic is interfering with the distress transmission.

- The station in distress will use the expression “SILENCE MAYDAY” or “SEELONCE MAYDAY” which is the internationally understood term.
- Other stations imposing silence during a distress situation will use the expression “SILENCE DISTRESS” or “SEELONCE DISTRESS”.

In either case the request for radio silence is addressed to “ALL STATIONS”, or to a particular station if it can be identified.

Should radio silence be imposed during a distress situation, all traffic not associated with the distress transmission must cease immediately.



INTERNATIONAL DISTRESS CALL/ANSWER

Canceling a Distress Message

When a station is no longer in distress, the station which transmitted the distress signal and any station which relayed the distress message, will transmit an “ALL STATIONS” message advising that the distress traffic has ended.

The correct procedure for canceling the distress message is:

- the word “MAYDAY” (Transmitted only once.);
- the words “ALL STATIONS” (Repeated three times.);
- the words “THIS IS”;
- the call sign of the station transmitting;
- the filing time of the original distress message;
- the call sign of the ship, aircraft, vehicle, which had been in distress;
- a short plain language description of why the distress situation is being cancelled;
- the words “SILENCE FINISHED” (Distress traffic ended.); and
- the word “OUT” (Transmission is ended).

If involved in a MAYDAY, remain calm. Deal with the emergency first (i.e., if it is an injured fire fighter - apply first aid), then transmit the MAYDAY as quickly and clearly as possible.



INTERNATIONAL DISTRESS CALL/ANSWER

PAN-PAN — URGENCY SIGNAL

In radio communication, the urgency signal is the word “PAN-PAN” spoken three times. PAN-PAN indicates that the station calling has a very urgent message to transmit concerning or advising of possible jeopardy to life.

Similar to the distress message, the urgency signal PAN-PAN is used only on the authority of command personnel. The urgency signal will be followed by a message giving details of the situation.

The same procedures stressed in MAYDAY transmissions are followed. Refer to the PAN-PAN transmission example provided below:

- “PAN-PAN, PAN-PAN, PAN-PAN”
- “ALL STATIONS, ALL STATIONS, ALL STATIONS”
- “THIS IS SEA FOX CZ3929, THIS IS SEA FOX CZ3929,
THIS IS SEA FOX CZ3929”
- “Located three zero zero yards off Point Atkinson, engine
seized, drifting towards rocks. Request tow to Horseshoe Bay.”
- “SEA FOX”
- “OVER”.

Often, the difference between a PAN-PAN and a MAYDAY is only a matter of time. For example: In the text book sample transmission, Sea Fox is drifting towards the rocks. If rescue is not immediate, Sea Fox will be in a MAYDAY (life-threatening) situation. Therefore, give as much information as possible and explain the circumstances of the PAN-PAN. (I.e., how much time does Sea Fox have; will the vessel find itself on the rocks in one, two, three, etc., hours?)



INTERNATIONAL DISTRESS CALL/ANSWER

SECURITY — SAFETY MESSAGES / ALERTS / WARNINGS

The safety signal, in radiotelephone communication, is “SECURITY” (pronounced **SAY-CURE-ITAY**) spoken three times. Personnel transmitting a SECURITY message follow the same procedures outlined for MAYDAY and PAN-PAN transmissions.

The safety signal indicates, the station calling is to transmit a message concerning safety of navigation, road alerts, or weather warnings. All stations hearing the safety signal must continue to monitor the frequency until satisfied that the safety transmission does not affect them.

The following is an example of a safety transmission.

- “SECURITY, SECURITY, SECURITY”
- “THIS IS TUG CRUSADER VG 2010, THIS IS TUG CRUSADER VG 2010, THIS IS TUG CRUSADER VG 2010”
- “Log boom adrift and breaking up six miles south of Merry Island. Menace to Navigation.”
- “Tug Crusader VG 2010”.
- “OUT”.



COMMON FM RADIOS

THE FOREST SERVICE COMMUNICATION NETWORK

To this point, students are aware that reliable radio transmission depends on many factors including the range or area to be covered, the terrain or geography, the antenna height and gain, the carrier frequency, and the interference potential. These points must be thoroughly considered before deciding upon suitable equipment. But there is occasion when the transmitting distance is simply much too large for the FM radio wave to cover, and the signal fails to reach the receiving station.

The transmission path of FM signals is defined as being line-of-sight. And despite the valuable benefits of FM transmission (consistent signal level and reliability), FM radio's range is short. Therefore, when it becomes necessary to communicate beyond normal FM capability, repeaters are used to extend the range of FM communications.

WHAT IS A REPEATER?

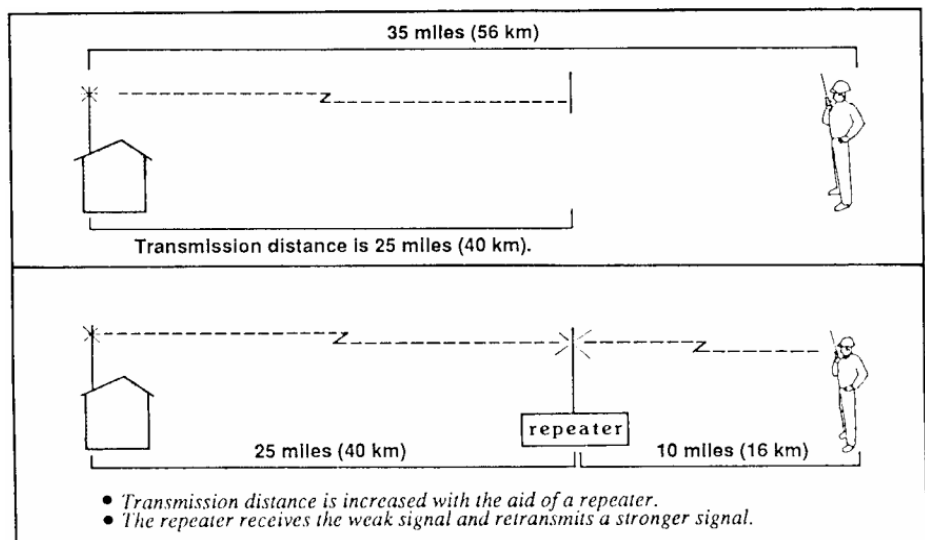
As the name implies, repeaters are essentially receiver-transmitter combinations which receive the FM signal on one frequency and simultaneously retransmit it on another. This ensures the signal is received by stations beyond direct range of the originating station. Therefore, the

range of base stations and some mobiles can be extended by the use of repeaters.

Repeaters also have the capacity to receive a weak signal, amplify it, and retransmit it at full strength.

One can see from this sample diagram that coverage from a radio mounted at a Zone Office would only

extend forty kilometers (25 miles), depending on the terrain. In order to extend the signal and cover a larger area, a repeater or repeater system is accessed.



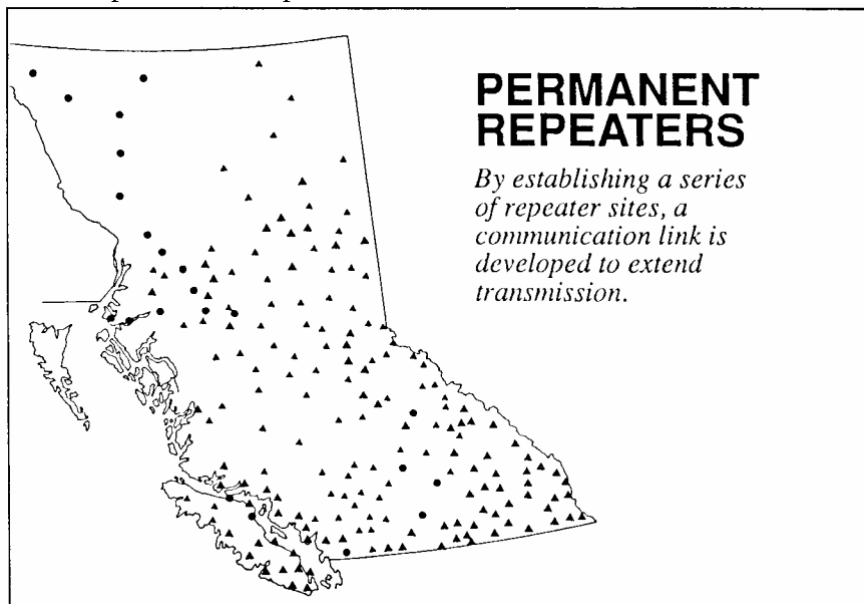
COMMON FM RADIOS

A repeater is nothing more than a radio (or combination of radios) connected in a manner which simply permits it to receive and retransmit radio signals.

FIXED OR PERMANENT RADIO REPEATERS

When the transmitting distance becomes too long for a single repeater, more repeaters are added. By establishing a series of repeater sites, a chain can be linked together to provide radio coverage over a large area. In other words, a network of repeaters is established. Unfortunately, every time a signal is repeated, some of the quality of the original transmission is lost. Therefore, there is a limit to the number of repeaters which can be linked together.

Each forest region maintains a complex FM network connecting the regional headquarters to each district office. Repeaters are used extensively in the Forest Service and are often linked together to extend transmission range. From the following illustration it is apparent that the Ministry of Forests has established an extremely large and comprehensive repeater network.



The Ministry of Forest identifies the various repeater channels in use throughout the province by colour. The colours used are red, purple, green, pink, blue, orange, brown, yellow, grey, and black (Simplex colours are gold, silver and copper). Red channel, for example, will be the same in North West Fire Centre as it is in South East Fire Centre. Repeater maps are particularly valuable when operating a mobile and must be consulted if there is doubt about which repeater channel is to be used.



COMMON FM RADIOS

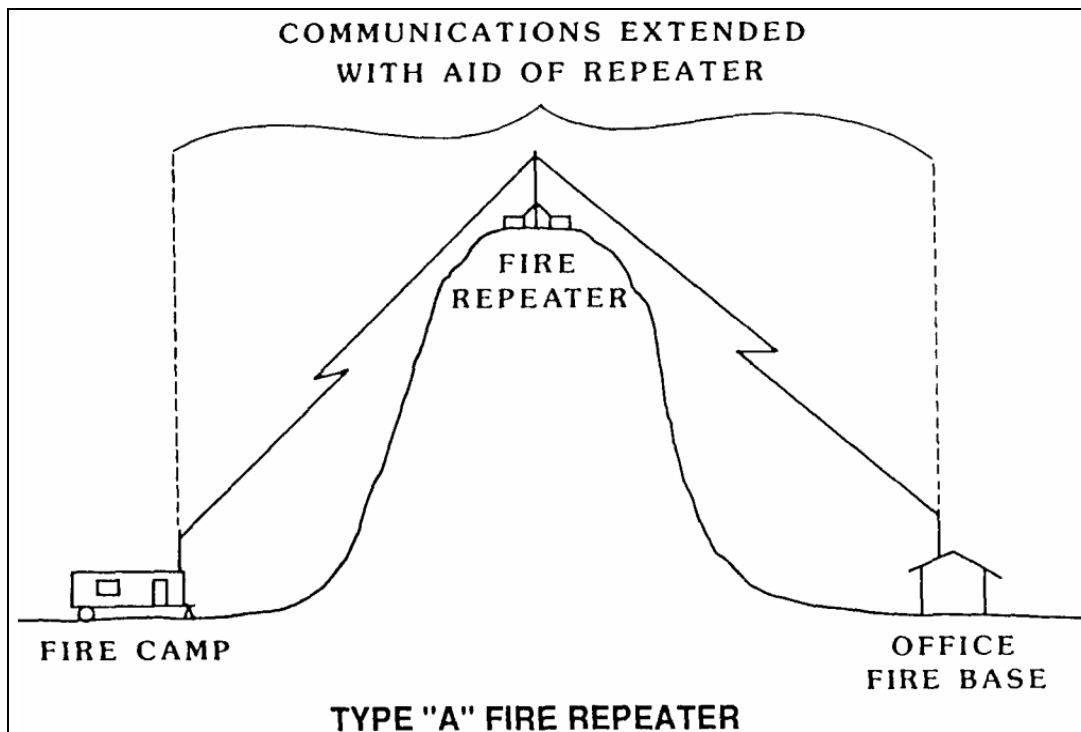
PORTABLE FIRE REPEATERS

When a fire occurs in an area where a permanent or fixed repeater has not been established, communication may be coordinated by dropping a portable fire repeater.. Installation of repeaters is carried out by either the regional electronics staff or the district office staff, depending on the availability of trained personnel, the requirements of the fire fighting force, and the urgency of the situation.

There are two types of portable fire repeaters in use by the Ministry of Forests: "Type A" and "Type B" fire repeaters.

Type A Fire Repeater

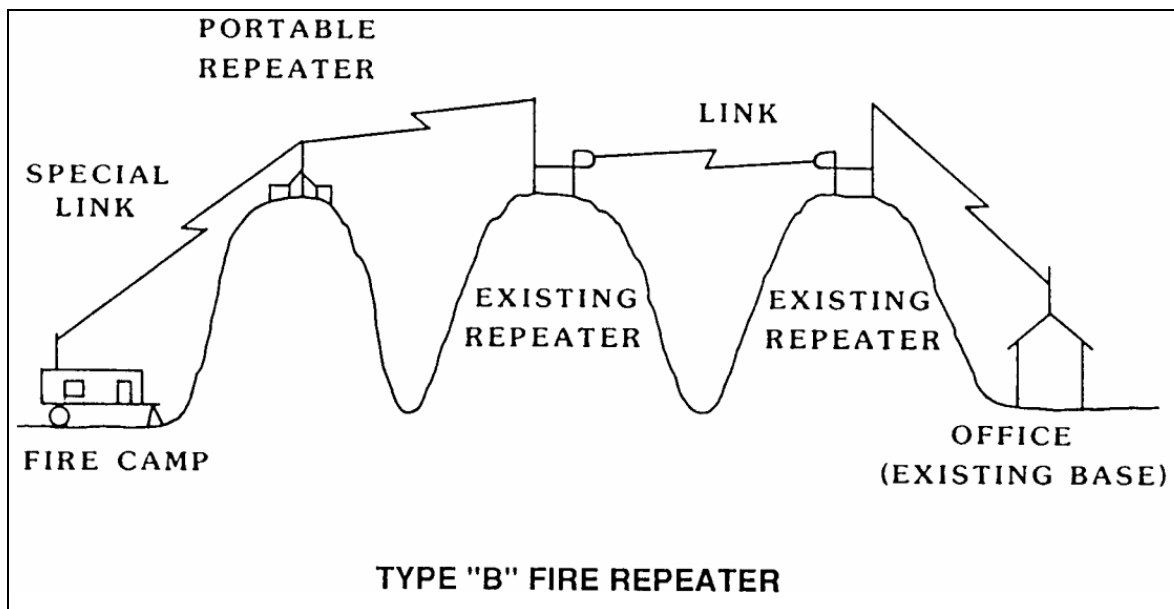
The Type A fire repeater consists of a single repeater and is designed to provide communications around a fire and the fire base camp. Type A repeater units come in both VHF and UHF. The repeater is packaged as one complete key, and although contents vary, it is usually made up of three boxes. One box contains 10 - 15 hand-held portables, another the repeater, and the third contains the battery box which powers the repeater.



Type B Fire Repeaters

The Type B repeater is designed to extend communications from the fire base camp back to the Fire Centre. It receives the fire camp's transmission and retransmits it to an existing repeater which links or ties into the Fire Centre.

Type B repeater packages contain a portable base station complete with antenna (for the fire camp), plus the repeater key which consists of the repeater box, battery box, and antenna complete with support structure. With newer Type B repeater units, the top of the repeater box is designed to accommodate the antenna, eliminating the need for an additional support structure.



It has been noted, that the base station included in the Type B repeater package establishes a communication link to the Fire Centre. The benefit of the Type B repeater and the key point to remember is that radios in the fire area will not be able to transmit to, or receive signals from the zone office. Communication is therefore separated. Fireline personnel and the fire base camp transmit on one frequency, while the repeater base station and the Fire Centre communicate on another.



RADIO EQUIPMENT — MINISTRY OF FORESTS

Advancements in radio hardware, modulating techniques, and communication systems, have contributed to the production of smaller, less expensive, and more reliable radios. These recognized advances have improved radio performance and provided a variety of services that can be adapted to serve particular and unique Protection needs.

The Forest Service is highly mobile and operates within a complex, uncertain and changing environment. The ability to anticipate what radio equipment is needed and adapts a communication system particular to a specific situation, has become a condition for successful fire suppression. The Forest Service generally uses **three types of radios**. They are:

- **High Frequency, Single Sideband (HF-SSB)**

A single one-way radio channel often referred to as line of sight channels. Your radio transmits a signal and receives a signal on the same frequency – but only one way at a time. An example is the BCFS ‘GOLD’ channel that transmits and receives on 163.830 MHz.

- **Very High Frequency, Frequency Modulation (VHF-FM);**

A 2-frequency system where you transmit and receive on separate frequencies - it is not possible to talk and listen at the same time. An example is the BCFS ‘Red’ channel which transmits on 163.065 MHz and receives on 163.935 MHz

- **Ultra High Frequency, Frequency Modulation (UHF-FM).**

A 2-frequency system where you transmit and receive on separate frequencies. A duplex is used allowing each user to talk and listen at the same time. An example is a BC Tel AutoTel channel which allows you to talk and listen at the same time.

RADIO OPERATION — GENERAL INSTRUCTIONS

The basic rules and principles of operating a radio apply to both SSB and FM radios. before using the radio the operator must determine the following:

- the call sign, or station name, by which the sending station will be known. Also, the call signs or names of stations with which the operator will be communicating;
- the operating schedule, if any, that must be kept;
- how to operate the equipment, check,...does the radio work? (Always check equipment before taking it into the field);
- if the radio is battery operated, how long the unit will operate on the supplied batteries and where to get extra batteries; and
- are there any special instructions or features that would affect the operation of the equipment. (If so, ask for assistance).



COMMON FM RADIOS

PORTABLE RADIOS

Portable or “Hand-held” radios are the most common radios used in fireline communication. Advantages of a handheld radio are: they can be assigned to specific users, are relatively compact and can be used easily on-the-move.

RADIO COMPONENTS:

- **Microphone or ‘Mic’ (Pronounced MIKE)**
- **Volume and Squelch Buttons;**
- **Push-To-Talk Button;**
- **Channel Selector or Key Pad**
- **Antennas;**
- **High Low Power Switch (some radio only);**
- **Batteries and Power supplies;**

Microphone (Mic) and Remote Microphone:

All handheld radios have a built in microphone in the front. The operator must remove the radio from its carrying case, hold it up to the mouth and speak directly into the front panel to transmit. The Mic converts audio signals into electronic signals for processing by the radio.

Remote Mics: The microphone is supplied with a rubber covered coiled cord, which can be extended to about 1.5 m, and a weatherproof connector. The microphone is equipped with a push-to-talk button which turns on the transmitter. The microphone connector plugs into a receptacle normally located on top of the unit housing. The remote Mic may also be replaced by a headset for use in noisy locations. Note: The speaker is also the Microphone in a remote Mic.

Squelch Control:

The purpose of the squelch control is to quiet the noise that radios generate when not receiving a signal.

All BCFS radios have a squelch control however this control is not always accessible to the operator. Those radios with internal squelch control will have been pre-set by a radio technician. Some manufacturers combine the ‘on/off switch, squelch control and the volume control as one switch.

PTT (Push-to-talk) Button:

The PTT button is depressed when you wish to transmit a message to another user. The button is located on the side of the handheld radio or if you have a remote Mic, it is located at the end of a coiled cord on the side of the microphone.

Channel Selector or Key Pad:



Channel selection on most radios is with either a rotary switch (which is numbered) or a key pad. On the keypad, press the channel number(s) then "enter" to select a channel. Some radios also have an "up" and "down" key to increment or decrement the displayed channel.

Antennas:

The antenna radiates power (a radio signal) into the air – without it your radio will be unable to properly transmit or receive and your message will not be heard. Radio signals, like visible light, can be polarized. Mobile communications uses vertical polarization - therefore the antenna needs to be mounted in an up-down (or vertical position).

Antennas have a specified length which correlates to the wavelength used for communications

Important:

- **Never hold your radio by the antenna;**
- **Do not transmit if there is no antenna on the radio;**

Hi – Lo Power Switch:

Some radios have a Hi-Lo Power switch which changes the output power of the unit. The 'Lo' position should be used when communicating in close proximity to another receiver. The 'Hi' position should be used to extend the transmission range.

Batteries and Power Supplies:

Dry Cell Batteries – The "AA" Cell Pack:

Depending upon use, fresh batteries can last from one day to several weeks. Heavy use may include: 1) Considerable transmit usage or 2) Heavy traffic on a channel which results in substantial audio received on your unit. It takes more energy to transmit than it does to receive.

When replacing old batteries, replace all batteries - not just a few. Dead batteries are subject to leaking and leaking batteries cause corrosion within the radio. If you are storing a radio for an extended period of time then remove the batteries.

ICOM CM4, or CM12, power packs are removed by sliding the battery pack sideways from the radio section. On ICOM models, except the H12, you must push up a "lock-release" button in order to remove the battery. The batteries are exposed by pushing the insert downwards from the top.

The BP194 battery pack on the ICOM F3 series radios is released using a thumbnail to press the release clip on the back portion of the radio.

Important:

- **ICOM H16, H18 and H19 models draw more current than H12 and F3 radios. A spare set of AA batteries should be carried when using these radios**



COMMON FM RADIOS

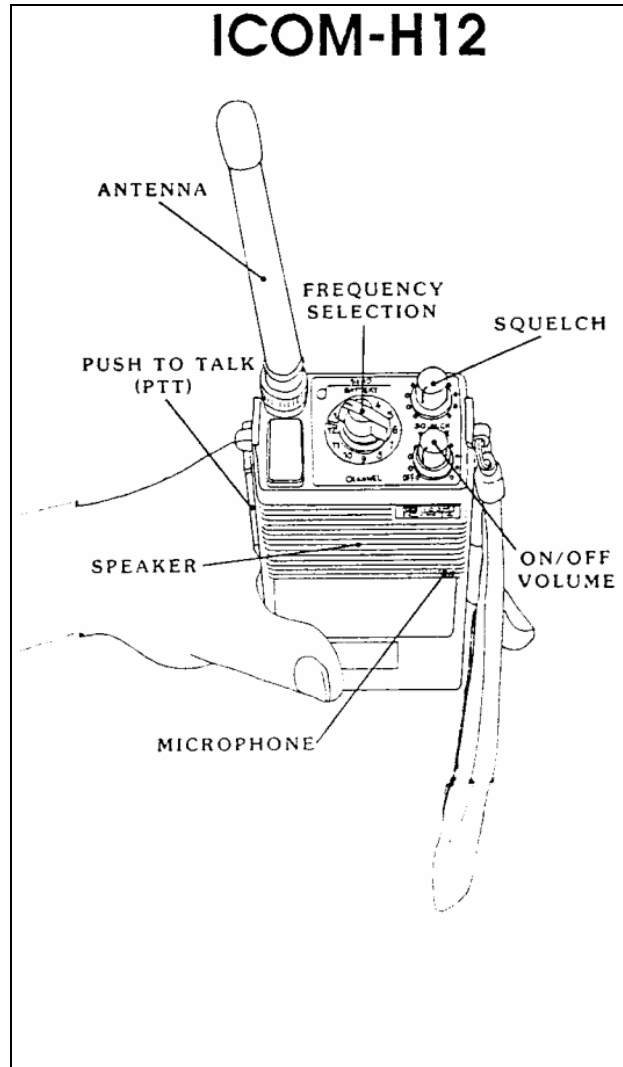
ICOM-H12 — FM HAND-HELD PORTABLE

There are a variety of models and makes of hand-held portable radio units. Despite different overall appearance, Forest Service hand-helds are all FM. This ensures equipment produced by one manufacturer can be used to communicate with units produced by another.

It is important to be able to interchange equipment. Thus ensuring the Forest Service continues to maintain one consistent communication network. As emphasized earlier, FM is predominantly used by the Forest Service.

Bear in mind that radio equipment should be treated with care. It is expensive. For example, simple hand-held units cost approximately \$500 while more sophisticated equipment can sell for \$3,500 or more.

The ICOM-H12 (ICOM) is a compact, 12 channel, VHF hand-held portable radio which weighs slightly over one pound (600 grams) and is familiar to fireline personnel.



ICOM-H12 — FM HAND-HELD PORTABLE

To Turn On

The on/off switch of the unit is combined with the volume control. Turn the volume control 1/4 to 1/2 turn. Turn the squelch control (to eliminate background noise/interference) clockwise just slightly past the point where the noise cuts off; rotating the squelch beyond the “cut-off” point actually renders the radio’s receiving capabilities in-operative. The squelch is used only on a channel free of active transmission. The unit is now set-up to monitor the selected channel.

To Transmit and Receive

Remove the ICOM from its leather case. Be cautious. Avoid any sideways pressure or tugging which could break the snap covering the portable. To re-emphasize: Do not use the antenna to remove the radio from its case. Pull the flap up and out to unsnap.

Hold the portable with the front panel directly in front of the face. The speaker should be only 1 - 2 inches (3 - 6 cm) from the operator’s lips. Press the “push-to-talk” button firmly. It is located on the radio’s left hand side (refer to the diagram).

When transmitting, the push-to-talk button is depressed until the transmission is complete. (Remember to speak slowly and clearly across the speaker in a normal-to-loud voice).

To receive, release the button and listen for a response. The radio’s receiver will not work when the push-to-talk (PTT) button is depressed.

Remember: Depress the PTT button to transmit — release the PTT button to receive a response.

Frequency Selection

The rotary switch on the very top of the radio should be turned to one of the available frequencies. Be sure it is clearly understood which frequency is to be used for which purpose (check with the supervisor).

To Turn Off

Turn the volume control counterclockwise. The unit is now turned off.



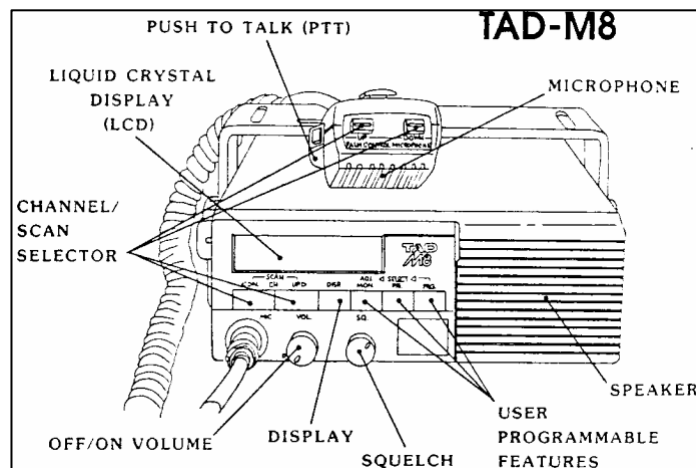
COMMON FM RADIOS

TAD M8 — FM MOBILE RADIO

In the past twenty-five years there have been incredible breakthroughs in the communications field. One of the greatest challenges of the 21st Century is the application of computer technology to radio communications. A few years ago, 32 channels were considered exhaustive. In the Forest Service today, there is occasion when 99 channels fail to meet the Ministry's communication needs.

A unique feature of the TAD is its user programming capabilities. The operator can program a variety of functions (e.g., scan modes) and the radio will automatically carry out the desired feature.

With reference to scanners, they are a standard feature on many multi-channel radios, are frequently used, versatile and help to make the operator's job easier. But it is critically important to thoroughly understand that scanners must be used with caution. For safety reasons, it is prohibited to use radio scanners when traveling on industrial roads. Drivers must, without exception, monitor the radio frequency of the industrial road they are traveling.



Ministry policy clearly states that personnel must monitor the industrial frequency in the area they are working or traveling. Fatalities have occurred when Forest Service personnel, listening to a ministry frequency, failed to receive the road alert transmitted from a logging truck traveling the same narrow industrial road.

The front panel of the TAD, with standard features noted, is equipped with a Liquid Crystal Display (LCD) showing the frequency and status information. (The back-light illuminates green when receiving and red when transmitting) and the radio can be programmed to operate in three types of scan modes.

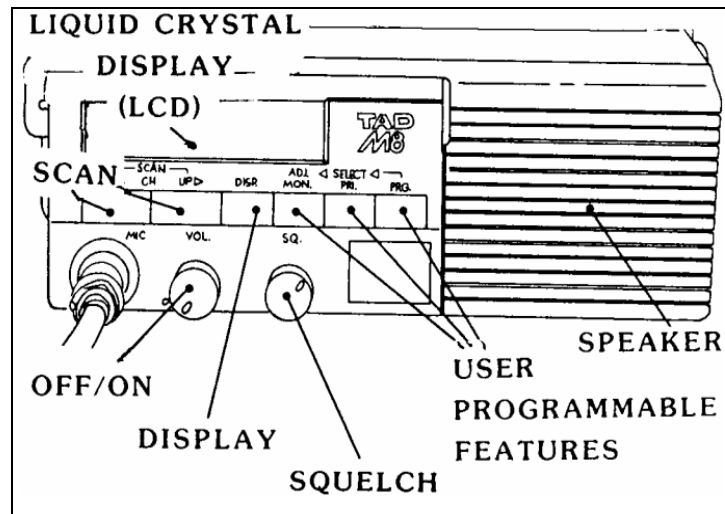
COMMON FM RADIOS

To Turn On

The volume and power on-off switch are incorporated into one control. Turn the volume control clockwise to switch the radio on.

Frequency Selection

To select the frequency, depress the UP or DN (down) channel keys. Channels appear on the LCD readout. When the correct channel is on the LCD, depress the DISP key again.



To Transmit & Receive

1. Depress the PTT (push-to-talk) button on the microphone to begin transmitting. (The back-light of the LCD readout turns to red).
2. Speak into the microphone in a normal tone voice.
3. Release the PTT button to receive a message. (The backlight of the LCD readout turns green).

To Turn Off

Turn the volume control counter-clockwise to turn the power to the radio off.

All vehicle mobile radios run off your vehicle battery. Power to a vehicle radios may or may not be routed through the ignition switch of the vehicle – you should know whether your vehicle is or is not powered through the ignition switch. To check, turn your ignition off; if you can still talk on and listen to your radio the ignition switch has been bypassed. This will allow you to monitor the radio system without having the keys in the ignition. Leaving the radio on will drain the battery in 8 to 72 hours depending on the radio, your battery condition and the outside air temperature.

Important:

- If your mobile unit is not wired through the ignition switch, it is a good habit to shut off the radio when you leave the vehicle for an extended period of time.

TROUBLE SHOOTING / MAINTENANCE AND REPAIR:

If you find that the unit does not appear to be receiving or transmitting - Consider and check the following:

1.The Obvious:

Is your radio turned on? Are you on the correct colour and do you have the correct tone for the area in which you are operating.

2. Radio Coverage:

You may be out of range of the receiving or transmitting station. If you are using a repeater remember repeater coverage far exceeds that of a 'Handheld'. You may be able to hear the repeater but they can not hear you.

3. Antennas:

Check to make sure the antenna is connected and not broken, ensure the connector is tight. The Rubber Ducky™ antenna (rubber coated) antenna will usually show visible damage.

4. Microphones:

If the unit has an external microphone or a "speaker Mic", a break in the microphone cable could be the problem. You may be able to finish your conversation by twisting or holding the microphone cable. If a replacement microphone is available, try it. In the case of a "speaker Mic", remove the speaker Mic and try the unit again.

5. Batteries: (See 'Batteries and Power Sources)

A common problem is weak but not dead batteries. Replace the batteries and try again. Check for corrosion caused by leaking batteries

6. Water Immersion:

If your radio has fallen into FRESH or SALT water, turn the radio off and remove the batteries immediately.

If your radio has fallen into SALT water flush it well (batteries removed) with Fresh water and return it to the nearest BCFS Radio shop – Speed is essential. If you are returning it wet, bag it in a plastic zip lock bag, try to remove all the air from the bag and then send it in for repair.

If it is impossible to immediately return the unit then attempt to dry the unit out by placing it for several hours in a location where the ambient temperature is between +40° C and +100°C. Return the unit to the nearest BCFS radio shop at as soon as possible.

Important

- ***Return defective units to the Regional Radio Shop for repairs, with a note giving details on symptoms, problems and/or troubles encountered.***



SATELLITE PHONES

Recently, satellite phones have become very portable and reception is almost guaranteed if you can see the sky. They allow the fire crew to have two-way communication with the Fire Centre. The battery needs to be re-charged so, if you are issued one, conserve battery life and carry two batteries. Let the Fire Centre know when you will have the phone off and ensure you remember to turn it on prior to a scheduled check in if this is your only communication.

To use the satellite phone, simply turn the phone on, rotate the antenna all the way to the left, wait until the LCD screen says you have acquired satellite coverage, dial the number and push “send”. This is an expensive call, so make sure you keep the message short and clear. Get out the information, get clear directions and push “end” to terminate the call.

Satellite phones can also double as a cellular phone in most cases. If you are operating the phone as a cellular, simply pull the small antenna up and dial as you would on a cellular phone. As it is less expensive for cellular calls, always check to see if you are in cellular range before making the call go through the satellite.

Ministry satellite and cellular phones should only be used for official Ministry of Forests business. Private calls are not allowed and will be questioned when the bill comes to the Zone Manager.



APPENDIX 1

GLOSSARY OF RADIO COMMUNICATION TERMS

Antenna - The part of a radio transmitting system that radiates an electro-magnetic field into the surrounding space.

Bandwidth - The amount of space or range of frequencies in the electro-magnetic spectrum occupied by a signal.

Base Station - Fixed radios (neither portable nor mobile). Base Stations are usually installed in regional and district offices, but there is occasion when a base station is established in the field.

Call Sign - Identifies the transmitting or receiving radio station. A call sign is assigned to every fixed or transportable radio station by the Department of Communication and must be used at the beginning and end of every conversation. (Call signs for all Forest Service mobiles and hand carried portables are assigned by the Fire Centre or Zone.) When in the field, Crew Bosses use their surname as a call sign to identify their radio.

Certification - With a few exceptions, the Department of Communications requires that every person operating a radio transmitter hold a certificate of proficiency. Certificates may be obtained by passing a written exam given by the DOC. The Ministry of Forests grants "operator eligibility" to personnel who have received radio training (i.e., Fire Communications - Course S-212).

Emergency - An unforeseen combination of life-threatening circumstances that calls for immediate action. (See: **MAYDAY**).

Fire Repeater - (See: **Repeater**).

Frequency - The rate at which repetitive cycles of voltage, current, power, or fields will change. The unit of frequency is the Hertz.

Hand-held Radio - A type of portable radio. A desired feature of hand-held radios is their compactness, which makes them relatively nuisance-free and easy to use in the field.

Interference - This is the term given to describe the confusion of radio signals caused by stray radio waves or by radio waves of different frequencies affecting each other. In receivers, a general term for any disturbance produced to receive signals by outside signals on the same channel during a transmission.

Jamming - A deliberate interference signal on a common channel designed to render the channel useless. The Department of Communications monitors radio transmissions to ensure violations, such as jamming, do not occur. (See: **Monitor**).



Licensing - All radio stations must have a license which is issued by the Department of Communications, Canada. The original license for Forest Service radio stations is held on file by the Manager, Electronics, Ministry of Forests, in Victoria.

MAYDAY - The priority distress signal indicating serious life-threatening or imminent danger. Mayday is used when immediate assistance is requested. When transmitted, the word MAYDAY is always repeated three times.

Microphone - A device for converting sound waves into electricity in order that information can be transmitted to a receiving station.

Mobiles - Describes radios which are normally installed in vehicles. Mobile radios are often designed to run off the vehicle's 12-volt battery.

Monitor (verb) - In reference to the Department of Communications, continuous observation of transmissions to ensure violations do not occur.

PANPAN - The urgency signal indicating a very urgent message concerning jeopardy to safety is to be transmitted.

Portables - Radio units which can be used on-the-move and obtain their power supply from either dry cell or rechargeable batteries. There are basically two types of portables: The compact hand-held radio unit (e.g., ICOM-12), and the more cumbersome, but still portable, box radios (e.g., Motorola Handie-Talkie).

Radio Communication - Communication by means of radio waves without any constraints (such as guides or wires), other than those imposed by the conditions prevailing, over the propagation path through space (e.g., the ionosphere).

Radio Frequency - An electro-magnetic wave. It is produced by oscillating or modulating the electric current in the radio antenna.

Radio Station - An installation comprising of antenna system(s), radio receiver(s), and/or radio transmitter(s).

Radio System - A group of radio transmitters and receivers arranged in such a way as to allow communication over an extended distance. (See: **Network**).

Radio Telephone - A radio that is connected to the public telephone network which allows any radio on the same frequency(ies) to communicate over the telephone system.

Radio Transmitter - Apparatus for the generation of radio frequency carrier energy/waves and means for its modulation.



Repeater - An amplifier which can pick up a weak signal coming along a line and send out, or retransmit, a new identical signal at full strength. Repeaters are basically receiver — transmitter combinations.

Scan/Scanning - A feature found on almost all multi-channel radios. Scanning permits the operator to monitor communications on all stations, or a combination of channels, by programming the radio to carry out scan functions.

Security (SAY-CURE-ITAY) - The safety signal used to transmit a message concerning safety to navigation, road alerts, or weather warnings.

Squelch - In receivers, a process sometimes used for the suppression of noise during a tuning operation. The squelch control is used for eliminating noise and is only operated when there is no signal on the channel. The degree of the sensitivity to incoming signals is adjustable. Operators are reminded never to turn the squelch beyond the point where the noise “just cuts out”. Taking the squelch beyond this point could render the receiver in-operative.



APPENDIX II

Sample Transmission No. 1 Crew Boss to Base Station

The life-threatening distress signal, in radio communications, is the word “MAYDAY” spoken three times. This signal indicates that personnel are threatened by grave and imminent danger and require immediate assistance.

- Crew Boss:** MAYDAY, MAYDAY, MAYDAY.
This is Jones Portable, Jones Portable, Jones Portable. Over
- Base Camp:** MAYDAY Jones portable, MAYDAY Jones Portable, MAYDAY Jones portable. This is Base Camp. Roger, MAYDAY. Over.
- Crew Boss:** I've got an injured crewman. He was hit by a snag. Needs immediate first aid and transportation. Recommend helicopter pick-up. Impossible to reach us quickly by ground. Over.
- Base Camp:** What's your location, and the status of the injured man? Is he with you now? Over.
- Crew Boss:** Location, south division by creek bed. There's a good clearing for a helicopter to land. Over.
- Base Camp:** Jones, what is the status of the injured crewman? I say again: What is the status of the injured crewman? Is he with you now? Acknowledge. Over.
- Crew Boss:** Sorry Jim. That's an affirmative. He's with me now. Looks like a bad head injury. The real worry is he has not regained consciousness. Also some concern about his back. Over.
- Base Camp:** Roger I've got a helicopter coming in with supplies right now. ETA is FIVE minutes. I'll contact the pilot and give her the details. Do you have personnel who can apply first aid? Over.
- Crew Boss:** Affirmative. Bill has some training and is doing what he can. But, we need to get this man out of here now. Over.
- Base Camp:** Roger. I'll get on this right away and back to you immediately. Fire Base Out.
- Crew Boss:** Jones Portable. Out.



APPENDIX II

Sample Transmission No. 2

Pilot To Crew Boss

Pilot: MAYDAY Jones Portable. This is helicopter PSX69. I say again: Poppa Sierra X-Ray, SIX, NIN-er. How do you read me? Over.

Crew Boss: Go ahead PSX69. This is Jones Portable. Over.

Pilot: Jim at Base Camp tells me you've got a medical emergency and need a pick-up.
Confirm: you've got a site for me to land? What's the exact location? Over.

Crew Boss: Affirmative. Location: South division, TWO, ZE-ro, ZE-ro meters from the creek bed. There's a clearing not far from my injured man. I'm sure you can easily see the clearing from the air. I say again: South division, clearing by creek bed. Acknowledge: I've got one of my crewmen there to direct you in. Over.

Pilot: Roger. South division, TWO ZE-ro, ZE-ro meters from creek bed. Crewman on-site to direct me in. Acknowledge: Is this a stretcher pick-up? Over.

Crew Boss: Affirmative. Over.

Pilot: Roger. I'll be there in FIVE minutes. Confirm. Over.

Crew Boss: Right Laura, FIVE minutes. We'll wait for that stretcher to bring this man out. Jones Portable. Out.

Pilot: PSX69. Out.



APPENDIX II

Sample Transmission No. 3 Pilot To Fire Office Base Station

Pilot: XLY74 Duncan, this is helicopter PSX294. Over.

F.O. Base: Say again. Identify yourself. Over.

Pilot: XLY74 Duncan—this is: I spell, PAH PAH, SEE-AIR-RAH, ECKS-RAY, TWO, NIN-er, FOW-er. Over.

F.O. Base: Go ahead PSX 294, this is XLY74. Over.

Pilot: Read back: Leaving Pat Bay at 14:20 for Pierce Island with crew of four (David, Steve, Colin and Gary). Over.

F.O. Base: Roger: Leaving, 14:20, Pat Bay for Pierce Island with crew of four (David, Steve, Colin and Gary). Check in once you've landed and give me a status report. Over.

Pilot: Roger that. PSX294. Out.

F.O. Base: XLY74. Out.

It is recommended that operators spell out words, call signs, or coordinates, which:

- could be confused/misinterpreted; or
- those requested by the receiving station.

The words "I spell" are stated, by the transmitting station, prior to spelling out a word, Call Sign, or coordinate.



APPENDIX II

-- TEN MINUTES LATER --

Sample Transmission No.4 Pilot To Fire Office Base Station

Pilot: XLY74 this is helicopter PSX 294. How do you read me. Over.

F.O. Base: PSX294 this is XLY74. Go ahead. Over.

Pilot: Landed 14:30. Crew walking into the fire area. Looks like a fairly small spot fire.
We took a quick look at it from the air. I/C, Steve Burns, advised he would
be contacting the FCO after he's completed reconnaissance. Over.

F.O. Base: Roger. That crew's going to need transportation out. Did Burns give you any idea
of how much time he'll be needing? Over.

Pilot: Negative. Only that Burns would be contacting your FCO with a report. I'm returning
to Pat Bay now. PSX294 Out.

F.O. Base: Roger. XLY74 Out.



FIELD EXERCISES

Preparation:

Essential Resources:

- radios; and
- batteries.

Field Exercises:

This exercise can be carried out inside or outside. Each trainee will demonstrate they are able to transmit and receive information clearly with a portable radio.

Point out the importance of clear direction when using a radio.

For the remainder of the training session, radios may be used as a resource. They should be allocated effectively and should be passed from trainee to trainee, so each gets an opportunity to use.

