

Emergency Communications Primer

By Eric Polson, N7EJP

ejpolson@comcast.net

(503) 359-7849

Purpose

Introduction to the concept and practice of emergency communications

Target Audience

New Amateur Radio operators and those new to Emergency Communications

Highlight Arrows:



Cautions



Please Consider

Background

Emergency communications occur when there has been some level of emergency involving an area or situation where normal communications, such as landline or cellular phones are not available. Such communications can become critical during events such as earthquakes, floods, snow storms, terrorist attacks and severe winter storms.

Situation Examples:

1. Simple – not in range of any normal communication resource such as cell phones
2. Complex – event that disrupts one or more mediums of communication

Example Disruptions:

1. During Katrina, all phone service became unavailable due to the level of flooding and power outages experienced.
2. During the earthquake that damaged the Fukushima Nuclear Plant in Japan, power, phone and internet lines were severed. Normal modes of communications were severely hampered or not available at all.
3. Closer to home, during the Vernonia floods, communications mediums were unavailable due to the high water level.
4. Portland has also experienced recent events where neighborhoods were isolated due to inclement weather and heavy snow.

Amateur Radio and Emergency Communications

When the need for emergency communications arises, the most common form of communications are provided through amateur radio operators. Along with the amateur radios will typically be an operator (the level of experience and competence of the operator can vary significantly) and sometimes an assistant that takes and prepares messages. Message passing can take a couple of main forms:

Simple Form:

In its simplest form, the radio operator will initiate contact with another operator and pass information about the emergency from the scene of the emergency to an operator that is capable of routing the information to the nearest entity established to handle the type of

emergency message.

Complex Form:

In its most complex form, there will be a “traffic management” entity. This can consist of a single radio operator or many radio operators. The traffic manager(s) will receive initial information and determine an alternate frequency from one to many “traffic handling” frequencies for handling the specific issue. This serves to keep the main “logging” frequency as clear as possible and provides a far less congested venue of communications for traffic to pass through.

If you are a single radio operator representing a single entity within a large emergency, you may or may not be able to get information in or out of your area. If you can reach a “**traffic management operator**”, you will most likely be directed to a less congested frequency (**traffic management frequencies** will typically have strict rules for access). Do not assume that you can simply move to one of the **traffic management frequencies** without first getting permission. They have to be tightly managed in order to maintain proper records within the emergency.

If you are a single radio operator with a large emergency representing a collection of entities, such as a neighborhood CERT or similar established group, you will likely have a designated frequency for communications. This frequency may be different from the larger “traffic management” frequency, or it may be the same. If it is a designated frequency for your group, it will most likely be less congested than the “traffic management” frequency. If it is not a designated frequency, you will probably be required to check into the **traffic management frequencies** from where you will receive further directions on where to go.

Issues you will need to consider during the initial stage of an emergency:

1. If you are the first person on the scene of the emergency, you will be the “**traffic manager**” for that emergency communications net until relieved by a designated “**traffic manager**”.

2. If it is apparent that you are an amateur radio operator, you may be pressed into service to assist in an emergency. **If you do not feel you are qualified to do so, let the requesting person know immediately.** Do not put yourself in a position where you can get overwhelmed. Doing so might put more people in jeopardy.

3. Do not alter any message by changing, removing or adding information to it:

- Transmit the message **EXACTLY** as given to you.
- If there is any part of a message that needs clarification, request clarification **IMMEDIATELY.**

4. There **MUST** be one and only one person in charge of the emergency. If that has been you, then you should expect someone else to arrive and assume the responsibility as quickly as practicably possible.

5. The average time a single person can provide “traffic management” during a heavy traffic emergency may be as short as two hours. Do not try to perform at a level above your abilities. If it is time for you to leave a position, let the appropriate person know immediately. Hanging on can put people in jeopardy.

Equipment to expect to need during an emergency

As an amateur radio operator, you can expect to be asked to assist with communications.

➔ If you do not feel you have the experience or equipment to assist, don't be ashamed or let a need to assist put you in a position where you may fail. Anyone familiar with the needs that occur during a disaster or emergency will fully understand your desire to avoid making a bad situation worse.

That being said, here are some thoughts on the equipment necessary to adequately and successfully assist during a disaster or emergency:

1. **Radio equipment** – a minimum for providing support would likely be a mobile dual band radio. It should be a radio that you are familiar with programming without assistance as the frequencies to be used in the emergency are probably NOT already programmed into your radio.
2. **Antenna** – if the radio is located in a vehicle, then you will likely already have an antenna installed. If you are employing a “go bag” radio, make sure the antenna is a good fit for the radio, and that you can mount the antenna sufficiently high to be able to reach your intended traffic manager.
3. **Power supply** – if the radio is mounted in a vehicle, then the vehicle’s power system will be more than adequate to run the radio for an extended period of time. Be sure NOT to let the power supply (vehicle’s battery) become depleted to the point where it cannot start and run the vehicle. Also be sure that the vehicle has sufficient fuel to not only keep the radio running, but return you to a desired point of origin.
- ➡ 4. **Food and water** – a typical “go kit” will contain sufficient food and/or water to support you for 72 hours (three days). If you have the resources, bring as much additional food and/or water as you can carry with you.
- ➡ 5. **Proper clothing** – you may need more than the clothes you are wearing. If possible, bring enough clothes to keep you clean and warm for as long as you may be needed to provide communications support.
- ➡ 6. **Other supplies** – the more you can bring to support your stay, the better off you and those you are helping will be. Things like fire-making, sleeping, shelter, food preparation and movement supplies could enhance your value significantly.

Radio Equipment

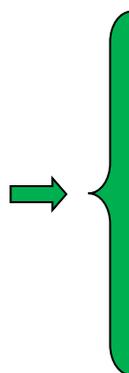
Now let us deal with the topic where many people want more specifics.

VHF/UHF

The simplest communications package consists of a handheld VHF/UHF radio such as the Yaesu FT-60 radio, an extended range antenna, such as a magnet mount that can be placed on the roof of a vehicle, a “clam-shell” battery pack that can accept off the shelf batteries and maybe a lapel microphone with a speaker in it. This would be sufficient to get in contact with entities that are relatively close to you.

An alternate and more viable communications package would consist of a “mobile” radio mounted in your vehicle with a dedicated and permanently installed antenna. Such a radio would provide more transmission power and the antenna would typically increase the sensitivity to signals giving you longer reception range.

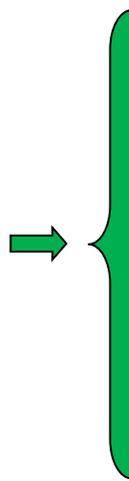
The deployment kit that I keep ready contains:

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1. VHF/UHF radio with cross-band repeat capabilities (Yaesu FT-8800 in my case)
 2. Battery capable of running the radio for a minimum of 12 hours
 3. Terminal Node Controller (TNC) for making “machine to machine” connections
 4. Power supply that can operate off a generator
 5. 18 foot mast with a tripod base
 6. 60 inch VHF/UHF antenna
 7. 100 feet of coaxial cable for connecting the radio to the antenna
 8. Handheld radio with VHF/UHF capabilities that also contains a GPS (Yaesu FT-1XD in my case)
 9. Laptop computer

HF (High Frequency)

An **all band kit** may also serve you well. In an all band kit, you would not only have most of the capabilities of the VHF/UHF kit, but would also have HF capabilities that will provide considerably extended range communications. With this extended range, you are not reliant on just whatever local network you can connect to, but would have the ability for extended long-range communications should a local network NOT be available or within your reach.

The deployment kit for my **all-band radio** consists of:

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1. All band radio with the additional capabilities of digital communications, access to APRS messaging and GPS location (Yaesu FT991A in my case).
 2. Large battery capable of running the radio for up to 24 hours without assistance.
 3. Power supply that can operate off a generator.
 4. 120 watt solar panel
 5. HF antenna (Chameleon MPAS)
 6. 18 foot mast with a tripod base.
 7. 60 inch VHF/UHF antenna.
 8. Small gas generator (Honda i2000 in my case)
 9. 50 feet and 100 feet of coaxial cable for connecting to the antennas
 10. Handheld radio with VHF/UHF capabilities that also contains a GPS (Yaesu FT-1XD in my case) which can provide the GPS signal the Yaesu FT-991A uses.
 11. Laptop computer

For this kit, I do not need the TNC (yet I still bring it in case I need it), as the connection that would have been made in VHF/UHF is typically done with just a “sound interface”. That is accomplished with a USB cable connection to my laptop computer. An alternate “sound interface” would be to purchase a product like the Signalink® by Tigertronics that accomplishes the same function.

Kit Selection

The choice of which deployment kit to take is based on the type of deployment I am making. For a simple local deployment, the VHF/UHF kit will most likely suffice. For longer distance or longer deployments, the all band kit would most likely be chosen. In some cases, a single handheld radio may be more than sufficient.

Experience will be the most heavily weighted decision factor, followed by training and input from documents such as this one.

The key elements that determine the choice I make are:

1. Where am I going?
 - a. If I am traveling a long distance and only need short distance communications, a single handheld may work, or the small kit may suffice. The needs I expect to encounter are the heaviest decision factor.
 - b. If I am traveling a short distance, a handheld or the smaller kit may suffice.
2. How long will I be there?
 - a. If I am going to be on location for a short time, a handheld or the small kit will be the most likely choice, unless I specifically know that I will need HF.
 - b. If I am going to be on location for an extended period, than the large kit is chosen as I anticipate it will eventually require longer distance communication and/or the additional capabilities the kit provides.
3. Is this deployment Simple or Complex?
 - a. The simplest deployment requires little more than a handheld radio.
 - b. A more complex deployment will required either the small or the large kit. The decision will be based on the answers to more determinant questions.

➡ It will **ALWAYS** be better to err on the side of too much equipment than not enough. You can always leave equipment unpacked that is not needed, but you can never find suitable replacements for equipment not brought

Home Station

First, the communications station in your house should be in a survivable area of the house. If the area you set up the station becomes unreachable, then it does you no good. The communications station you set up at home should have VHF/UHF communications as a minimum standard. Second, the equipment needs to provide capabilities beyond what you will normally need. This is because you will never know what unforeseen event can occur. Third, it needs to provide extended capabilities, again beyond what you would typically expect.

It should include at least:

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1. VHF/UHF radio.
 2. House current power supply.
 3. Battery power supply.
 4. Writing supplies for any important messages or information.

If the house you live in is isolated, you may want to consider either adding an HF station or setting your communications station up with an all band radio. Again, the station should include at least:

1. VHF/UHF radio and/or.
2. HF or all band radio.
3. House current power supply for each radio.
4. Battery power supply that can be switched between radios or one for each radio.
5. Writing supplies for any important messages or information.

Generator

It may also serve you well to have a generator for at least the most critical electrical/electronic items you will need to survive. It should be understood that you will need to maintain sufficient fuel to keep the generator fed for an extended period, as you may not be able to determine when help may arrive.

➡ Solar Charging units may be another option for you to consider.

Vehicle Considerations

Careful consideration should be given to a vehicle that can be used to either get you out of a bad situation, or get you to an assigned area that is in need of communications capabilities.

The highest priority to a vehicle selection process should be:

1. How much fuel will the vehicle contain without additional devices such as “jerry” cans or other fuel storage? The fuel mileage and capacity will affect how far you can go, so the range of the vehicle is also an important factor.
2. Is the vehicle capable of getting through rough terrain? When there has been significant damage to infrastructure, a four-wheel drive vehicle may be the only type of vehicle that will be able to get through. The vehicle may also need to have sufficient ground clearance to manage adverse terrain.
3. How many days’ worth of supplies can the vehicle carry? The Oregon Emergency Management community has determined that it may be **months before significant assistance can arrive after a Cascadia Subduction Zone earthquake**. The more food and sundry supplies that the vehicle can carry, the better off you will be. If you can keep

an extended stay's worth of food ready in the vehicle without having to load the vehicle when it's time to go, then you will be better prepared for a hasty exit.

4. How well can the vehicle support an extended stay, should it become necessary? Things you may want to consider are:
 - a. Does the vehicle have enough space for you to sleep? If you have to leave during inclement weather, sleeping in adverse conditions may not be the best solution. Try to bring adequate sleeping supplies that will not be adversely affected by bad weather.
 - b. If the weather is mostly accommodating, is there space in the vehicle for you to operate when outside operations are unwise or it is not possible? This should include comfortable space for radio use AND a way to accommodate a laptop computer.
 - c. Upon arrival, will the vehicle be able to provide your fuel needs, should you need gasoline? If so, do you have the means to extract the fuel? Some devices that require fuel to operate may need substances added to the fuel such as oil, so be sure to have plenty of such supplies available.
5. Finally, **does the vehicle contain or can it easily carry all the communications equipment you will need?** The best solution is to have all the equipment needed installed in the vehicle. The next best solution is to have power access to support the equipment. The least solution is to have space to operate the equipment, but be reliant on power other than what the vehicle can provide.

Radio Equipment in a Well-Prepared Vehicle

Remember that all equipment connected to a vehicle's power supply will drain that supply. Be sure start the vehicle occasionally to allow the power to be replenished or set up a secondary power source from which to run the equipment.

VHF/UHF radio

The best option would be equipped with a GPS as well. With the GPS option, you would be able to show your position as well as be able to send small APRS messages when no other viable medium is available.

HF or All Band radio

This would give you the capability to make "long haul" contact in order to pass information well outside your location. There are a lot of examples of using HF during a disaster to provide much needed information well beyond the affected area both in the United States and overseas.

Communications Logging – during a declared disaster the ICS 309 Communications Log (or other ICS Logging) forms can be used to log official disaster related communications. In addition, if you are working in a declared disaster, the ICS 214 Activity Log will be required for you to log other significant events you are directly involved with. As a simple alternative, in the absence of a proper form, simple lined paper can be used. In either case, remember that you **MUST** keep the documents, as they will eventually be collected for inclusion in the official incident documentation.

Computer (such as a laptop)

A computer can be used for interacting with digital nets, sending digital communications, interacting with radio email systems and possibly logging activities. Whatever type of computer is employed, it should be able to run off vehicle power with a minimum of current draw. If possible, a low power drain printer would be an excellent asset to add to a vehicle.

Paper

Pads of paper for logging and alternate immediate area message delivery should be available. Pads of paper will never be done away with, and can serve a myriad of functions during a disaster, even starting a fire in the absence of other suitable fuel.

Being Part of a Deployment

Some people feel the call to serve. During a disaster or widespread emergency, there is no lack of need for people willing and able to provide communications assistance. If you are considering joining an organization that provides communications services during an emergency or disaster, there are a few considerations you will want to make:

1. First, you **MUST** make certain that your immediate family is safe from peril. There is no reason for you to leave those that need you. Take care of your home first. Once you have made sure that your immediate family is well provisioned and safe, you can leave to help outside your home.
2. Second, you will need to make sure that there is a legitimate need for your assistance. Unfortunately, many well-intentioned people may find themselves becoming more of a hindrance than assistance if they simply pick up their go-kits and head to the scene. Make sure by checking with local entities long before an incident if you might be needed and then make sure you know who to contact during an incident to make sure you are needed.
3. Third, you will need to have a specific location from which you have arranged to provide support. If you are not expected, you may prevent proper emergency support from working at its most efficient level. Again, as mentioned in item 2, make sure there is a legitimate need for you.
4. Fourth, do not leave for your support location without enough supplies to last until you can be resupplied. A good “rule of thumb” is to have at least seventy-two hours of food and water, and change of clothing. In some cases it may take longer to get replenished, but seventy-two hours of supplies should be considered a minimum.
5. Fifth, do not leave for your support assignment unless you are certain you have enough fuel to get to your destination and return home at least one and a half times. In other words, you should have at least three times the fuel in your vehicle that it would take you to get to your destination. Roads may be out or so heavily congested that you may be moving very slowly or at a complete standstill for long periods. This is NOT a situation where you want to run out of fuel and become stranded. You will have become an additional person needing to be rescued.

Emergency Net Structures

You will probably be involved in one of two basic types of nets:

1. **Simple Net** – This type of net will most likely consist of a single net controller and a single frequency. The net controller handles all traffic. Messages will be delivered directly to and transcribed by the net control operator. In the event of operators needing direct communications, permission is requested from and granted by the net controller. Such communication takes place on the net frequency, and, once completed, control is returned to the net controller. As long as the traffic volume is light, the net controller can remain in control for extended periods of time.
2. **Complex Net** – This type of net will be implemented when the net covers a large area and there is significant activity. The structure of this net will typically look like:
 - a. **Traffic Control Frequency** – This will typically be implemented as:
 - i. **Single Traffic Control Frequency** – When the area to be covered is not too large and can be handled by a single localized radio band, a single traffic control frequency may be implemented. The net controller will be responsible for coordinating subordinate frequencies that are used for traffic delivery.
 - ii. **Multiple Traffic Control Frequencies** – When the area to be covered is large and cannot be controlled by a single localized radio band, multiple nets will be implemented with responsibility for a specific sector of the effected area. There should also be a specific single control point net that is intended to receive statistical information, or high priority information intended for control point personnel only.
 - b. **Traffic Handling Frequencies** – The net controller for the control frequency will have at their disposal a listing of subordinate traffic frequencies. When an operator requests to pass traffic, the net controller will instruct the operator to move to one of the designated frequencies that is available. The net controller will log that operator on the assigned frequency. When the operator has completed the movement of traffic, the operator will inform the net controller that the traffic has been passed and the frequency is clear. The net controller will note the completion of the operation and mark the frequency as clear for traffic passing.

Due to the potential volume of frequency management, the “life span” of a net controller can be as short as a few hours. When planning is being done for such a net, the planners will accommodate for this “life span” and should have multiple net control operators available for a single shift.

You should be aware that operating on a net during an emergency can be a high stress operation and can exhaust you quickly. If you are planning on being a net operator you should plan on having few, if any, breaks during a shift. You should also be prepared by bringing plenty of fluids to drink and sufficient food to keep you alert during the shift.

It is a common practice to provide more than a single person to operate a net. In other words, there may be more than a single person operating as net control. In these circumstances, one will typically be considered the “senior” operator and will handle the bulk of the operation. Alternate net controllers will step up and take traffic that the “senior” operator cannot take because of being busy with either another call, or another task.