

Learning Unit 22

Modes, Methods, and Applications

ARECC

Objective:

This evenings training session is designed to help you chose the correct operating mode for each situation in an emergency communications environment.

Information:

Your purpose as Ares/Races emergency communicators is to provide accurate and rapid transfer of information from one place to another. To do that job well, you must understand the strengths and weaknesses of each mode of communication. In addition, you must be thoroughly familiar with the needs and priorities of the agencies you are serving. Some messages must be delivered quickly, and others are less urgent. Some are detailed, and some are simple. Sometimes you should not even use radio.

Some Concepts to Consider

Communication modes fall into several categories:

- Point to point -- Telephone, fax, some digital radio modes
- Multi-point -- Voice and CW radio, some digital modes
- High precision -- Fax, e-mail, digital modes
- Low precision -- Voice, CW, telephone
- High priority -- Voice, telephone
- Low priority -- Fax, e-mail, digital modes, CW

Messages fall into similar categories:

- Point to point -- Messages intended for one party
- Point to multi-point -- Messages intended for a group
- Multi-point to point -- Messages from members of a group directed to one station
- High precision -- Lists of items, medical or technical terminology, specialized or detailed information

- Low precision -- Traffic reports, damage estimates, simple situation reports
- High priority -- Fast delivery is critical
- Low priority -- Messages can be delivered in a more relaxed time frame

Each type of message should be sent using the most appropriate mode, taking into consideration the message's contents, and its destination(s). An example might serve to illustrate these concepts. A localized flash flood hit an area a few years ago, prompting the evacuation of a low-lying neighborhood. The Red Cross opened a shelter in a church several miles away from the affected area. ARES was mobilized to provide communication support. In spite of the weather, the shelter still had electricity and phone service. When the county Emergency Coordinator (EC) stopped by the site, the ARES operator on duty was using his battery-operated 2-meter hand-held radio and the wide-area repeater to talk to Red Cross HQ across town. The ham was reading a three-page list of names and addresses of evacuees who had checked into the shelter. To ensure proper transcription, he was spelling each name phonetically, pausing after each name to see if the headquarters station needed fills. Needless to say, this was a time-consuming process. The operator had been reading for almost 15 minutes and was still on the second page of the list.

Less than 10 feet away from his operating position sat a fax machine. The EC turned on the machine, dialed the Red Cross fax number, and fed in the remaining page of the list. The ham on duty had used over 15 minutes of air time and precious battery capacity to read two pages. The third page was faxed in less than 20 seconds. Neither the operator at the shelter nor the one at headquarters had considered using the telephone or fax machine, even though these communication options were available and functioning. In all fairness to the hams in this situation, their training and practice had led them to concentrate on 2-meter voice to the exclusion of other modes of communication. So, instead of an efficient, point-to-point communication channel (telephone line), they had used a busy multi-point channel (the wide-area repeater). Instead of using a mode that generated automatic hard copy, they used one that required handwritten transcription. Instead of a high-precision transfer (fax), they had used a low-precision one (voice) requiring spelling and phonetics. The situation was especially pathetic because the repeater had been needed at the time for a different type of communication -- the transfer of mobile operator's reports, which could not

be done over the telephone. Further, it was later discovered that the "broadcast" of evacuee's names and addresses over non-secure communication channels was a violation of Red Cross policy. Of course, telephones and fax machines will not be available in every emergency. Sometimes only one mode will be available, especially when the emergency is totally unanticipated, utility service is interrupted over a wide area and the communicators are caught unprepared. But, with proper planning you can increase the likelihood that more than one option will be available. After all, we go to great lengths to make sure that 2 meter radios are readily available, so why not other communication options as well?

Tactical Messages:

Tactical messages are usually low-precision and time-critical, and can be passed most efficiently using voice. Depending on the nature of the message, it may take the form of formal written traffic, or at the other extreme, it may mean that the microphone is handed to a person from the served agency. This is frequently the quickest way to get the job done.

Lists and Detailed Messages:

Some messages contain long lists of supplies, or details where accuracy is important. Voice transmission can introduce errors, and long messages can waste valuable net resources. The various digital modes (including land-line fax and email) offer the best means of handling these messages, since they are both fast and accurate. Digital messages also have the benefit of repeatable accuracy. When a message is passed through several stations, it remains unchanged since no operator intervention occurs.

Sensitive Information:

Some messages contain information that should be kept private. Reporters and the general public commonly use scanning receivers to monitor public safety and Amateur Radio communications. Names and addresses of evacuees should never be transmitted over voice channels, since thieves with scanners can use this information to loot unattended homes. Learn in advance your served agency's privacy policy regarding certain types of information. Some groups have switched to digital modes, such as packet and Winlink, in an attempt to offer more privacy. Although digital transmissions require more than a simple scanner to intercept, they cannot be relied upon for absolute privacy. The equipment needed to receive most

digital modes is available, and is even built into some newer receivers. Anyone wishing to monitor digital transmissions can certainly do so. Discuss this issue with your served agency before using any Amateur Radio mode to handle sensitive messages.

Remember - any means of assuring meaningful message security on Amateur Radio would be in violation of the Part 97 prohibition against the use of codes and ciphers. If absolute privacy is required, the message should not be transmitted by Amateur Radio. In some cases, the most appropriate method might be hand delivery by a radio-dispatched courier.

Digital Modes

Traffic nets handling large volumes of written or high precision traffic should consider using one of the digital modes. Digital modes can be used to transmit long lists such as health and welfare traffic, and logistics messages involving lists of people or supplies. Some digital modes provide virtually error-free transmission and relays can be accomplished by retransmitting the received digital message without having to retype it. Digital modes that do not provide automatic error correction should only be used when clean and interference-free signals can be guaranteed. These modes include RTTY, AMTOR mode A, and PSK31 in BPSK mode.

HF:

The best digital modes for HF operation are Winlink, packet, AMTOR mode B, and PSK31 in QPSK mode. In general, antenna and radio considerations are similar to voice or CW operation, although certain digital signals require less power than voice modes to achieve the same effect.

VHF/UHF:

The TNC (Terminal Node Controller) FM packet is the most common mode used on VHF and UHF frequencies. The antenna and coverage considerations are the same as for FM voice.

Packet:

Packet communication is error-free in point to point "automated repeat request" (ARQ) or "forward error correction"(FEC) broadcast modes. The most effective way to send messages via packet radio is to use a "bulletin

board." The sending station "posts" his messages on the bulletin board, and other stations can then retrieve their messages at will. Urgent messages can also be sent directly to the receiving station if needed. Bulletin-board stations are also useful when a number of stations are sending messages to a single point, such as a command post, weather service office, or emergency operations center. Similarly, bulletin-boards can be useful in handling outgoing traffic. Stations with traffic can post messages to the bulletin-board. The traffic handlers can periodically pick up the traffic and send it to the outbound NTS nets.

If your group is using FM packet, ask if transmissions are simplex point to point, or if nodes, digi-peaters, or bulletin-board forwarding systems are being used. You will need to know which frequencies and modes are used and for what purpose, what their call-signs or aliases are, and how various parts of the system interconnect.

A consideration is that multipath propagation may distort digital signals enough to cause failure when a voice might still be understandable. The solution is the same as in voice mode -- move the antenna a few inches or feet until you get a clear signal.

Packet Teleprinting Over Radio (PACTOR):

This is a combination of packet and AMTOR. It is designed for HF use only, and combines the best features of both. PACTOR uses FEC and ARQ modes, and a standard keyboard. PACTOR is quite robust (more so than AMTOR and RTTY), but can be slowed by poor band conditions.

Related considerations:

Become familiar with, and practice using, any digital mode or system well in advance of an emergency. Most are complex enough that some experience is required to use them efficiently and effectively.

Digital communications can be enhanced by composing the message off-line in a text editor. With a little ingenuity, "fill in the blank" forms can be created in most word processors to reduce the amount of typing required and help standardize message formats. For packet communication, consider an emergency communications-specific program like ARESPACK. The high duty-cycle of many digital modes requires a rugged radio and power supply

with adequate cooling. Test your equipment under field conditions for an extended period of time to identify any possible problems.

Amateur Television (ATV)

There are two forms of ATV -- slow-scan and fast-scan. Fast-scan ATV is live, full motion TV similar to what you see on commercial TV, but usually at reduced quality. Slow-scan ATV uses a voice-grade channel to send a still picture line by line. It can take more than a minute for a color picture to be transmitted.

ATV has a number of emergency communications applications, but all involve letting emergency managers see what is going on in the field without ever leaving their offices. ATV crew's usually take a passive "observer" approach, and avoid interaction with bystanders to ensure that a situation is accurately represented. No emergency communications ATV transmission should ever be "staged" for the camera.

Review:

Choosing the correct mode and frequency for each type of message will make your nets more efficient and improve service to your agency. Voice modes are low precision, multi-point modes, and many digital modes are high precision point to point modes. Sometimes, Amateur Radio is not the best way to send a message. Confidential messages are best sent via telephone, fax or courier.